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WELDING

A Feature of Ford Production

The first of two articles dealing with the exceptional advances made in welding practice by one of its chief exponents

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ONE TRIP through the River Rouge plant of the Ford Motor Company should be enough to convince any production executive, not alone of the feasibility, but of the economy and reliability of resistance and arc welding on a production scale. It stands to reason, of course, that no car in which welding plays so important a part could have attained the popularity and reputation for safety which the Model A Ford has attained, unless the dependability of welded parts, which include many of the most important structural and highly stressed members of the car, was established beyond a shadow of doubt. And welding offers facility in production as well as dependability.

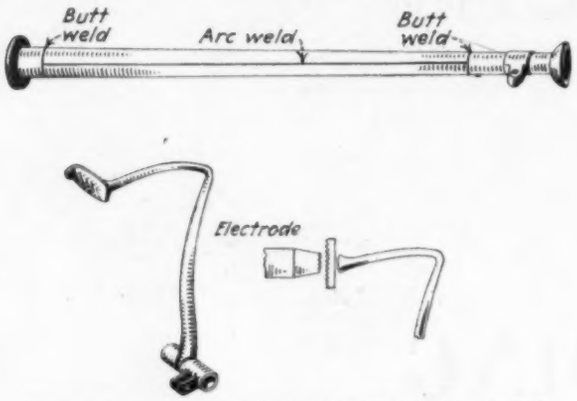
There are in a Ford car with sedan body over 1,500 resistance welds. Many of these are spot welds, but a large number are butt flash-resistance welds made in steel which varies from a few thousandths of an inch to over one inch in thickness. In some cases the area of the weld is several square inches. Even stainless steel is being resistance-welded successfully, and continuous arc-welding of axle-tube seams in an automatic machine recently has been developed for regular production.

Troubles originally encountered in resistance welding as a result of the need for frequent redressing of copper dies, which tend to go out of shape under the high temperatures and pressures involved, have been overcome almost entirely by the use of copper-tungsten alloy facings silver-soldered to the dies at critical points where the work is gripped at or near the weld. In some cases the body of the dies, which is of copper, is water-cooled.

Success has not been attained in many cases, however, without extensive and costly research work in which the precise conditions necessary to secure dependable results were learned. Even then it frequently was necessary to build a special semi- or fully-automatic machine which would reproduce the required conditions unfailingly, thereby eliminating human errors, before results that could be depended upon day after day were secured.

In consequence, a large proportion of the welding

machines now used in the Ford shops eitner were developed and built largely or wholly in Ford shops, or were built in outside shops to specifications laid down by Ford engineers. Many of the features involved, however, now are made available in more or less "standard"



Torque tube used on Ford AA Truck. The flanged members at each end are butt-welded to the tube itself, which is rolled sheet stock arc-welded. Stamped pedal pads now are spot-welded to the forged shank by corrugating one electrode to mate with the pedal pad surface, making the weld almost invisible

machines built for the trade by established manufacturers of welding machines, so that most of the same results obtained by Ford can be duplicated in any shop in which the number of parts to be produced warrants the necessary investment in equipment. It is evident that the metal-working industry owes the Ford company a debt of gratitude, first for perceiving the advantages that welding on so large a scale can bring to the metal-fabricating art, and also for using its resources to solve the problems involved.

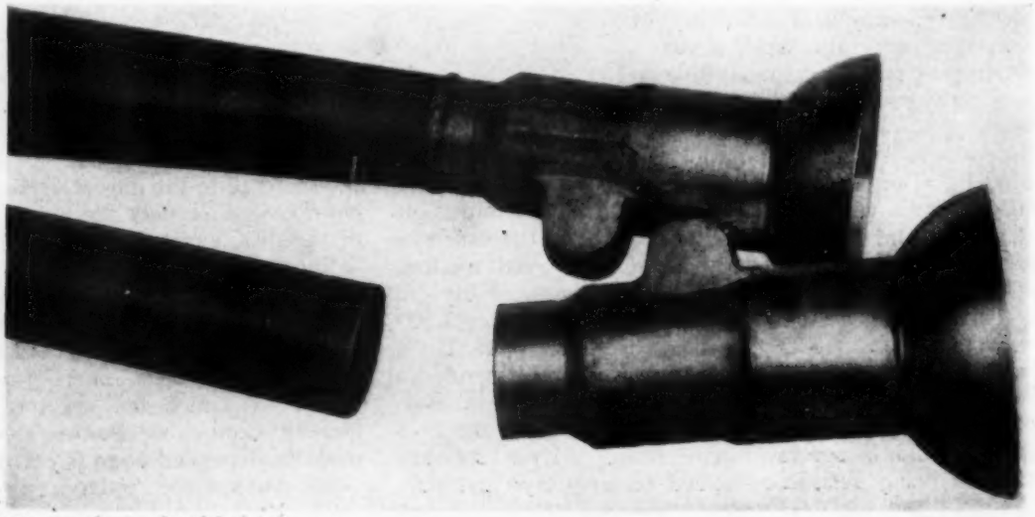
One notable result of Ford practice has been to reduce the average size of pieces produced and, in consequence, to make possible their production at a more rapid rate on relatively smaller machines. Thus, for example, a rear axle tube having a forged bell at one end and a forged hub and spring perch at the other, instead of being made in one or two pieces, which would be cumbersome to handle and machine, is made in four pieces machined separately and assembled afterward by welding. So accurately is the welding done that parts can be machined, except for finishing cuts, before welding, and over-all dimensions often are held within a few thousandths of an inch. Then the only machining necessary after welding (and sometimes a straightening operation) is that required to remove the flash at the welds and to take a light cut from some surfaces previously machined.

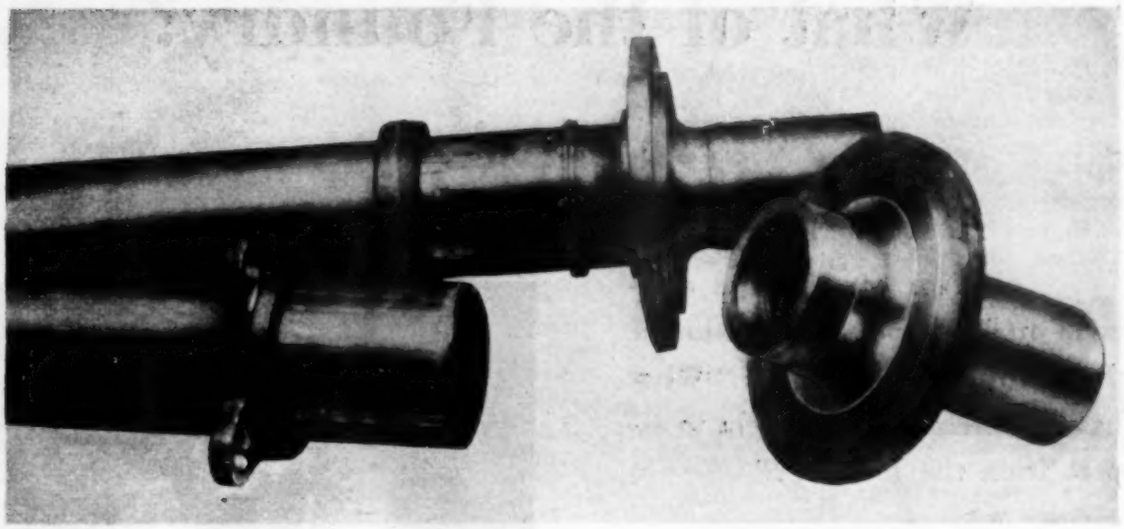
In many instances, some of the parts entering into the welded assembly are heat-treated prior to welding, while others are not. The welds are made in such a way that the heat of welding does not change the physical characteristics of the metal except at and immediately adjacent to the weld, where, of course, the section is made amply heavy to withstand safely the stresses imposed in service. Under these circumstances heat-treatment can be confined to parts in which it is needed, and other parts can be made without heat-treatment from less expensive steel and with corresponding reduction in cost.

To insure perfect resistance welds, it has been found necessary to make the section of the two pieces at the weld exactly the same. Otherwise the flow of current is not the same in the two pieces, one is heated to a higher temperature than the other, and the weld is not uniform. Therefore, when a tube, for example, is to be welded to a solid part or bar, the latter is cupped adjacent to the weld so that the section at this point exactly equals that of the tube to be joined by welding. Perfect welds then are secured without difficulty.

Among the simpler but fairly heavy welding jobs done on Ford Model AA truck parts is that of the propeller shaft. A 12-in. length of this shaft is machined, splined, and heat-treated before welding. It then is welded to the other and longer section of the shaft, which is made from 1½-in. bar stock also finished before welding, but requiring no heat-treating. Welding is performed in 250-kva. 440-volt standard Ford resistance welders. One man makes welds at the rate of 450 per eight-hour day. The total length of the two pieces is 1 in. greater than the finished length, this amount being allowed for upset in making the weld. Pressure for upsetting in this and many other of the

Forward end of torque tube, showing parts before and after welding, the latter before flash is turned off. The forging is rough-machined and necked to the same section as the tube before welding





Axle parts of the Ford truck before and after butt-welding the flanged hub to the 3-in. tube, which has a $\frac{3}{8}$-in. wall. In a later operation the collar is fastened in place, using an automatic arc-welder

resistance welding machines used is applied by a long lever which the operator handles. In other cases, hydraulic pressure devices are employed.

In the welding of this long shaft, the length is held within $\frac{1}{16}$ in. of nominal size. Immediately after welding the shaft is put in a lathe, tested for run-out, straightened if necessary, the flash turned off, and the shaft delivered to the grinding department for finish-grinding of the outside diameter of the splines—the only accurate machine work required after welding.

Another of the heavy jobs on truck parts is that of welding a flanged end-piece to the torque tube, which measures $4\frac{5}{16}$ in. outside diameter at the weld and has a $\frac{1}{4}$-in. wall. The flange is forged with a short tubular extension and is machined before welding. Two men, serving a 350-kva. Ford welder, turn out from 1,000 to 1,200 welded tubes a day. This welder has air-operated clamping dies and a hydraulic upsetting head. The upset in this case is $\frac{3}{8}$ in.

To the other end of the torque tube, which is tapered down to $2\frac{1}{2}$-in. diameter, is welded a ready-machined forging having a part-spherical flange for fitting against the universal joint cover. This weld is made in a butt welder fitted with air-clamping dies, a Ford hydraulic upsetting head, and a 220-volt switch which in turn operates the switch on the 440-volt circuit on which all flash-resistance welding is done. The production rate on this job is the same as on the other end, and the over-all measurement is held within $\frac{1}{32}$ in. of nominal length.

After welding, the tubes are checked for run-out with a dial indicator and are straightened under a punch press if run-out limits are exceeded. Flash then is turned off both welds inside and outside the tube, after which the flange is finish-turned to give correct length and thickness. There is also a gaging operation to check the line-up of the flange holes in reference to other parts. Similar operations are performed also on the Model A passenger-car torque tube.

In building up the rear axle for the truck chassis, tubes of 3-in. diameter and with $\frac{3}{8}$-in. wall are welded to hub forgings having a flange with tubular extensions at each side. These welds are made on the standard Ford 350-kva. butt welder with hydraulic head. Axle length is held within $\frac{1}{32}$ in. and run-out within 0.015 in. on this operation. In this case the hub is rough-turned before welding, but the holes in the flange are not drilled until later.

Prior to making this weld, a forged collar with ears that form brackets for the emergency brake shaft is pressed over the tube. After the hub is welded on, this collar is arc-welded in place while the axle is rotated slowly under a standard General Electric head, which feeds the welding wire automatically. Operation in this case is from a 60-volt constant-potential generator. After these welds are completed, the flash is turned off, various surfaces are finish-machined, the entire assembly is heat-treated, and surfaces requiring most accurate finishing are ground.

Numerous other parts in the chassis of both truck and passenger car are assembled by similar welding methods. Where the parts are small, as, for example, in assembling $\frac{3}{8}$-in. cold-rolled brake rods to forged clevices, welds are made at rates as high as 200 per hour, the length of the rod being held within a limit of $\frac{1}{32}$ in.

Until recently, brake and clutch pedal levers have been welded to pedal pads having short shanks forged integrally with them. To speed up this operation and reduce the cost of the parts, a stamped pedal pad now is welded to the lever after the end of the latter has been mushroomed out in a cold-forming operation. The welds now are made on a standard 200-kva. Ford spot welder, the upper copper-tungsten electrode of which is corrugated to fit the corrugations on the front face of the pedal pad. With this design of electrode the spot weld is practically invisible on the face of the pad. No machining of the pad after welding is required.

In a second article, to appear shortly, several of the other operations performed in welding Ford chassis parts will be described.

What of the Foundry?

Discussion

Two contributors comment on Mr. Lord's clarification of the troublesome subject, "What has the machine shop a right to expect from the foundry?"

JOHN MARK MAY

THE ARTICLE "What of the Foundry?" by Chester B. Lord, on page 679, Vol. 72, of the *American Machinist*, dwelling on, "What has the shop a right to expect from the average foundry that is not equipped specifically for repetitive work?" presents one side of the question ably and fairly, but like all other problems, there is another side to the question.

First of all we must remember the fact that the foundry's reputation is always at stake, and that it is rated by its average product just the same as the shop. The foundry cannot equip itself to make single pieces or small lots to the best advantage for the same reason that the shop cannot do so, but there is this difference, the foundry's limited product is reflected mostly in the quality of its product whereas the shops limited product is reflected not so much in the quality as in the cost, due to the necessarily different methods of doing the work.

A die maker is justified in cutting and trying to determine the size and shape of blank required for forming intricate pieces. Why not allow the foundry trials with difficult patterns where there are so many factors entering into the job, such as quality of sand for different castings, and sometimes for different parts of the same casting, the hardness of ramming, venting, gating, shaking out, the mix of the material, temperature of pouring, etc., all of which must be correct, and different for each type of casting to secure the best results?

Machinists are trained to take accurate measurements: they think in accurate terms. Foundrymen are not required to take accurate measurements; in fact most of their work is done without measuring, other than to the extent that they can judge by the eye. The survival of the fittest applies to foundry practice as well as other places, and the fact that no foundry fully lives up to the expectations of the shop should at least go part way in convincing the shop man that there is a vast difference in their occupations and that the particular foundry he is dealing with is a fair average.

The foundry should not use "smooth-on" or "burn-in" castings without knowledge and consent of the shop. Both, however, can be done in some instances without harm, effecting a saving.

Pattern number locations should not be left to the judgment of the pattern-maker or the foundryman if there is any portion of the casting where the numbers would be objectionable, but in such instances should be located on the drawing.

It would surprise the average shop man to know how small a percentage of fairly made patterns the foundry gets to make castings from in small amounts. Many patterns, for economic reasons, are made good enough to get by to make one casting only, as it is not expected to use them again. Yet the pattern is kept, and in spite of its rapid deterioration is frequently used many times to make single castings.

The foundry has a right to expect that the complete cost of a job be estimated and the most economical way used, even though it involves extra machine work, providing that it can be done cheaper than by doing the extra work necessary to accomplish the desired end in the foundry.

The shop should not expect to get well-made castings in unreasonable time. Foundry work, for satisfactory

results, must be well planned and requires fully as great ingenuity to meet the varying conditions of the work as the average shop problem.

The foundry should accept the full responsibility for good cleaning. No shop can do this work as cheaply as the foundry, and any attempt to machine poorly cleaned castings always adds more to their cost than is saved in the foundry.

The foundry has a reasonable right to expect co-operation not only from the shop but from the engineering and pattern departments as well. The engineering department may feel that, figuratively speaking, all things are possible, but they should also realize that many things are not expedient. The ideal casting is of an even section. All castings should approach that ideal condition as closely as possible. All corners should be filleted as far as practical to insure a better flow of metal and a more uniform and stronger casting.

Many times bosses are out of place due to the fact that they could be placed in different positions. Don't blame the foundry for this, as the pattern-maker could have made them in such a way that they could be used in only one, the correct, position. Lastly, when the shop receives castings the foundry should reasonably expect due consideration of their cost. No casting should be returned that can be satisfactorily used by doing additional work upon it, if the cost will not exceed the value of the casting.

WILLIAM BRYCE
Sheffield, England

I WAS INTERESTED in Mr. Lord's outspoken article on this subject on page 679, Vol. 72, of the *American Machinist*. My work brings me in touch with foundry and machine shop, and he expressed my sentiments in most, though not all, respects. My remarks take the form of agreement, variance, extenuation, and suggestion.

Agreement: Foundries certainly vary in efficiency. The Allis-Chalmers type, recently described in *American Machinist*, is much above the average, while others are much below it. Even those on repetition work are open to criticism and make loads of scrap. Bad dressing is common, and faking is to be deprecated. Rap is often excessive, and varies, thus affecting size. There is often twist on castings, which could be obviated by better fitting boxes. As to blow holes, the writer recently saw a ton casting on which machining revealed holes as large as walnuts.

Variance: The author seemed to blame foundry for that for which other departments are responsible. Such tendency is often noticeable, and foundry foremen need a thick skin. Designation numbers, correct draught, machining allowance, mating without fitting, lugs for bolting down, position of bosses and ribs, varying flange diameter, facing room, etc., all depend on the pattern shop. This department should see that work done by various individuals coincides. It is also for this department to discuss discrepancies with the drafting department and co-operate with foundry and machine shop.

Extenuation: In the foundry, very much depends upon chance, and on work done by others. Molders are not dullards; they labor under technical difficulties which many do not fully appreciate. The fitter, machinist, even the blacksmith, can see what he is doing and make tools to insure accuracy, but molders cannot. They contend with faulty boxes, sand, patterns, metal, poor light, and there is the possibility of molten metal shifting small projections in the mold. In all this they are helpless. I consider it easier to supervise a shop of forty fitters or machinists, than a foundry of fourteen molders.

Suggestions: More than any other department, the foundry needs plenty of expert supervision. Expense should not be spared if efficiency is expected. The foreman seldom has time for details, and should have at least one expert to act as critic of appliances and material, advisor to men in difficulties, and inspector of castings. By keeping in touch with all jobs, looking to the conditions of patterns and core-boxes, holding himself at the disposal of men needing guidance, such a man could minimize scrap, save time and maintain general efficiency.

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Allis-Chalmers Model U Tractor Plant
Discussion

H. W. LIEBERT
General Superintendent, Tractor Division, Allis-Chalmers Manufacturing Company

ON PAGE 202 of Vol. 83 of *American Machinist*, Wm. Bryce, of Sheffield, England, makes some complimentary remarks about the Model U tractor plant put into operation last year by Allis-Chalmers and described so completely in issue No. 11 of Vol. 72. At the end of his comments, Mr. Bryce asks some pertinent questions which I shall attempt to answer:

Did all machinery work out as anticipated, or could improvements be made?

Prior to the purchasing of machinery, anticipated production time was estimated by the manufacturers supplying machinery and, if found satisfactory by the management, was approved and accepted. This anticipated time was then checked against actual performance of the machine. It is gratifying to note that all machinery purchased and as presented by the manufacturers, was as expected, and no machinery was rejected. We have, however, made some minor improvements in some of the machinery, and have no doubt that we will continue to make others in the future.

Whether one man operating several machines created labor friction?

We have had no labor friction due to one man operating two or more machines. In fact, it is accepted by operators doing this class of work as a matter of daily routine.

What system of payments by results was adopted?

From past experience we have adopted a standard time bonus system of payment in lieu of piece-work, the chief reason being that once the standard time is set, it is unaffected by the hourly day rate, which can be variable. Standard time workers are paid at their hourly day rates for actual hours worked, and in addition a bonus is paid on the efficiency of the workmen for standard time work performed during a pay period. The efficiency of the workmen is determined by dividing the total allowed standard time hours by the total elapsed hours on standard time work for a pay period (2 weeks). Hours that are not possible to cover by standard time, also extra hours allowed for overtime, are eliminated from bonus calculations and are paid for at the straight day work hourly rate.

EXECUTIVE FORUM

Dole or Control?

IT WAS one o'clock, and as usual, the dining room of the Manufacturers Club was crowded. Bill Holland stood in the doorway waiting to be directed to a table when he noticed J. J. Masfield of the Masfield Foundry and Machine Company beckoning him.

"You haven't been out to see us lately," said Masfield, after Bill had taken a seat opposite his friend. "I wanted to have a talk with you. The unemployment situation has been worrying me. We've had to let a number of our men go. Some have been with us for years. It seems to me that the company owes them something to tide them over, but we've made no provision for this and cannot afford it financially. I'm concerned not only with the present depression, the worst of which is over, but with means of avoiding a repetition of these conditions in the future."

"It comes back to the old question of smoothing out the peaks and valleys in business," said Bill. "As yet, we haven't controlled this, but I feel we're making progress."

"And in the meanwhile, what of the men who are thrown out of work?" asked Masfield. "I notice the General Electric Company has created a fund to relieve unemployment. In England, the government has put the plan on a national basis. Why isn't this the solution?"

"You've mentioned two different solutions," said Bill. "One by private assistance and the other by legislation. I can see no objection against a strong, well-established concern aiding its employees during temporary lay-offs. But I don't believe many smaller companies could stand the financial burden—especially where competitors do not provide similar relief. The expense is greatest in slack times when their income is smallest."

"Then I take it you favor government control?"

"On the contrary, I oppose it on the basis that it helps neither workman nor industry," said Bill. "Once the question is thrown into politics it is used as a vote-catcher. Measures taken for temporary relief become fixtures—the dole is progressively increased until there seems little chance of getting away from it."

"But why get away from it, if it is affording relief?" asked Masfield.

"National employment insurance tends to perpetuate itself," said Bill. "It soons becomes a burden to industry through direct assessments or indirectly through increased general taxation. Manufacturing plants become less able to compete in world markets under the added load. They are likely to curtail purchases of new equipment which inevitably handicaps them further and slows up all industrial activity. The net result is a prolonged period of depression."

"But still you offer no adequate substitute to aid the idle workman," said Masfield.

"The dole does not help him," said Bill. "Besides creating more unemployment, it stifles his initiative and ambition. After living in idleness on government bounty, he may become resigned to his condition and accept the lower scale of living it provides. Surely this is not a step in the right direction."

"It's better than privation," said Masfield. "But what other solution is there?"

"A better understanding of economic influences that will eventually enable us to avoid violent business fluctuations. When we can do that, the unemployment problem will possibly be solved."

Topic suggested by W. J. Owens, Newport Rolling Mill Company

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What Did You Think About This Problem?

Unemployment causes thousands to suffer. In this day and age, something seems wrong with an industrial system that allows this condition to prevail. Are periods of depression avoidable, and shall we some day be able to decrease their violence? Meanwhile, does industry owe aid to the worker thrown out of employment? If such relief is desirable should it be undertaken by private agencies or by the government? Your opinion on these vital questions may interest other readers.

. . . Discussion
of Executive Problems

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Should Overhead be Uniform?

It is very apparent that a number of readers do not have the correct conception of the function of a system of cost accounting. This is evidenced by the comment of Mr. H. James, Birmingham, England, published by you on page 238, Vol. 73, wherein he states, "simply to satisfy the requirements of an up-to-date cost-keeping system."

Cost systems are designed for the purpose of compiling the various elements of the cost of manufacture into a figure that will tell the executive what his products are costing. Such information should be a valuable guide to him in establishing his company policies regarding price. It may be proper for him to allow the profit on one product to make up for the loss on another solely to avoid annoying the customer. However, I doubt if it is good policy. Certainly if it can be shown that an article costs so much, I cannot see by what reasoning anyone can say that it is good policy to sell below cost. The customer expects to pay a fair price for everything he buys. If the correct total and cost of an article is above the fair market price, something is radically wrong with manufacturing or selling methods, or possibly the manager is permitting some extravagances to creep into the burden element of his manufacturing cost. That is where the effort should be spent to reduce the cost.

It should be remembered that a modern cost-keeping system is not devised for the purpose of compelling the various elements of manufacture, selling, or even management policy, to satisfy its requirements. The reverse is true. An up-to-date cost-keeping system should satisfy the requirements of management, by giving it all of the facts regarding costs, be they high or low. By pointing out the inaccuracies, the system may be made a valuable aid to the manager in his function of setting company policy. —THOMAS B. FRANK, *Treasurer, Cincinnati Planer Company.*

Too Much Specialization?

Specialization, perhaps more than any other single factor, has contributed to the success of the modern industrial age. It has been, and is, a mighty force for good, and its principle should not be challenged merely because in its enforcement, the very human failure of allowing the pendulum to swing too far, threatens its supremacy in spots.

In the enthusiasm for functional specialization, it is very easy to be deceived into believing that when every known normal function has been provided, the system is perfect. This entirely neglects that very significant reason for having executives at all—to meet contingencies and emergencies. When functional organization deprives him entirely of all flexibility in meeting special and unusual problems, then it is blocking him in exercising the very ability for which he is paid. I have seen not only skilled mechanics performing laboring tasks, but the foreman literally running errands himself, because the functional control was so rigid that it was easier on the nervous system to do it himself, than to ponder the problem of which man he might fairly take from his assigned duties.

A single free lance laborer, or an unassigned handy man in a department will not jeopardize the specialization system, but will rather strengthen it. This will release the executive's mind from petty detail, and leave it free to concentrate on those major problems which are in turn his functional duty to perform.

—NICHOLAS RICHARD.

Jigs by Whom?

When the executives have decided to proceed with a program of production, the blueprints of all the components requiring jigs, tools, and gages should be sent directly to the toolroom foreman. Here we have the trained specialist who sees at a glance what is required and who, being provided with the necessary instruments, either makes detail sketches, or if his duties are onerous, is provided with a first-class deputy. There is no need whatever for executives or works managers to waste their valuable time on this work at all. The toolroom foreman is a scientifically trained expert, who can and will take all responsibility for jig and tool manufacture; his training is the most gruelling in the engineering industry.

He can foresee what no other class of executive can. The whole success of production depends on his ability to provide instruments of unfailing accuracy for production purposes. He should not be pestered with any officious supervision, but should stand or fall on the results of his department. —T. W. HOBBS, *Birmingham, England.*

Success or Successor?

One must admire the noble views of Mr. Craig, whose attitude is worthy of imitation by supervisors and workers alike. Without doubt, we are in the world for the good of the world, and not entirely for ourselves. Promotion should certainly follow such magnanimity as that of Mr. Craig, but one must admire the splendid way in which Mr. Holland plays the part of tempter.

It is certainly not general or common to see the chief deposed, and an assistant installed. Many firms are exceedingly honorable in this respect, and one sees many instances of promotion.

After all, taking the world as we find it, Mr. Craig's policy is somewhat doubtful. The principle is fine, but many things that are good are not expedient. The writer's experience and observation may have been unfortunate, but I find that promotion does not necessarily

follow. During a good number of years, I regret several minor instances of which I could speak from experience. Such experiences give one a shaking not soon forgotten. We used to be taught to make ourselves indispensable; are we to nullify this indispensability? An understudy can be quite submissive and respectful until he feels his feet; he then sometimes shows base ingratitude and contempt toward his tutor and helper. While Mr. Craig is noble, Mr. Holland is wise; therefore previous individual experience must decide. —WILLIAM BRYCE,
Sheffield, England.

Can Engineers Sell?

I say yes, engineers can sell, providing you find the prospects for them. My observations are built mostly on experience in selling a product that requires a great deal of engineering, and if the salesman hasn't the knowledge, he can't do much beyond making the contact. There are men that dig up new prospects, but machine tool salesmen as a class generally have the prospects handed to them on a silver platter.

To my mind, the most successful organization consists of a well functioning advertising and sales promotion department, which secures the lead for the sales engineer, who puts the deal over by proving the superiority of his tool for the job. He must know his business well enough to make decisions without writing home on every question that comes up.

In my estimation, a machine tool salesman must be about seventy-five per cent engineer and twenty-five salesman; he must be started off by the sales promotion department, as this type of man as a rule has neither the ability nor the inclination to go from door to door drumming up new customers. To have a man with qualifications reversed would be more expensive, because he would not be able to finish the job without much delay caused by dependence on the home office and would be in danger of losing the order if the competing salesman could answer at once. —J. C. P. BODE.

Wholesale or Retail?

I do not favor an industrial plant's going into retail business at wholesale prices. In addition to the obvious disadvantages to the local tradesmen, it isn't such a great boon to employees as many company executives like to believe. For example, it often results in the husband of the family expending on luxuries or semi-luxuries, income that the wife sorely needs for necessities, prompted by the lack of masculine judgment in such matters, or a desire to flash the same new luxury the rest of the men are buying. Articles so purchased through limited selectivity, may be high in intrinsic value, but utterly unsuited in their ability to match other home equipment.

Many articles are damaged in shipment, or perhaps do not come up to the maximum performance of the general run of such products—the employee would soon let his local tradesman know of such a circumstance. If he has bought from the company at wholesale, he naturally cannot demand service or the exchange privilege. Many times he is allowed a liberal discount by his local merchant for his obsolete model when purchasing a new product; but he obviously cannot ask the company to take the old unit off his hands.

The company may feel that such a service represents clear profit to the men, equivalent in wages to the discounts. This is so because a practice grows slowly, and the additional cost in administration is absorbed into the business costs, and any increase in force made is charged to increases in the business. Yet, any concern that would abruptly discontinue the practice, and at the same time transfer personnel out of the department handling this retail business, would find that the department in question will function smoothly with the reduced personnel. The money thus saved might even be enough to provide a small raise in actual wages for all concerned—a far more equitable method of distribution for the general good of all the community.

—B. E. LAMBERT,
U. S. Naval Aircraft Factory.

Inspection or Discretion?

The inspector should be conversant with the function of the part he inspects, and if the part is slightly below the low limits prescribed by the drawing, should determine by assembly whether the article is acceptable or not. In connection with this, the inspector should call the attention of the designer to any dimension where the tolerance may be enlarged without interfering with interchangeability.

The average designer is under the impression that he has not done his duty unless every dimension on the drawing is given in four decimals, even on a wind fit, and does not realize the increased labor cost entailed when the mechanic has to work to close limits.

—R. HOPPE,
Rock Island Arsenal.

The Other Fellow's Toes

If business is slack it is natural to consider the advisability of extending the line of manufactures, but before this is undertaken, the standard line should be carefully considered. Overcapacity naturally suggests approach to saturation of the market, but may also be caused by too many producers entering the field or by greatly improved methods of manufacture. Extending the market by advertising and appointing agents further afield may effect a cure unless the line is one with only special localized demand. Where the demand is seasonal and will return, manufacturing for stock may be considered. If the market is being taken by competitors, it is time to overhaul the sales methods, the product itself, or the methods of production.

If a new line is imperative, careful selection must be made and its effect on future business should be considered. To make an exact copy of another manufacturer's machine is not good policy. Where there is a large and growing demand for a machine, and manufacturers in the field are not able to keep up with the demand, it may be possible to come to an arrangement to make parts or even to make the complete machine, under license if the machine is patented.

—ALBERT F. GUYLER,
Nottinghamshire, England.

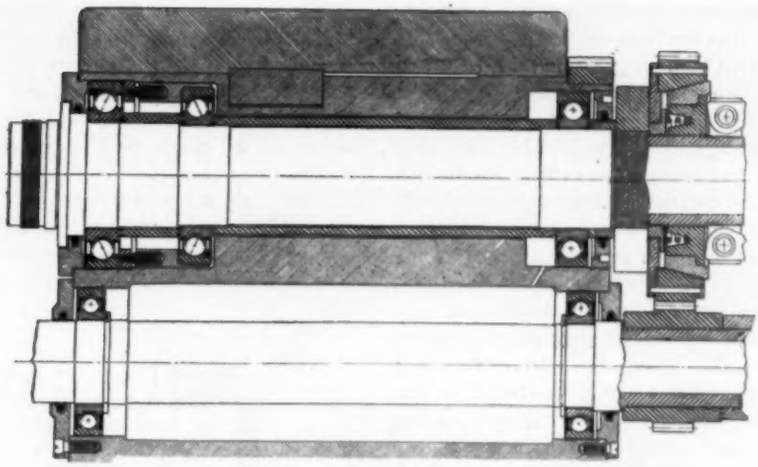


Fig. 1—Bearing loading by helical springs lacks adjustability and permanence. The single locking of all inner races proves troublesome

Progress in Preloading

T. C. DELAVAL-CROW
Chief Engineer, New Departure Manufacturing Company

Recounting several steps in the development of ball bearing spindle mountings in machine tools

EARLY attempts to apply anti-friction bearings to machine tool spindles were unsuccessful because of certain misconceptions regarding their mountings. It was not fully recognized that the load-carrying ability of these bearings depended upon deformation of their component parts. The popular theory, that the fixed member should not be pressed into its housing, resulted in radial clearance in assembly.

The requisites of satisfactory anti-friction spindle bearings are:

1. Maximum rigidity and minimum runout under operating conditions.
2. The maintenance of this precision throughout the machine life.
3. Freedom from cramping because of temperature variations.
4. Maximum percentage of input power available for metal cutting.

Radial ball bearings do not in themselves eliminate either radial or longitudinal motion. Rigidity, however, may be obtained by producing an initial thrust between two bearings having angular contact between the balls and the races. For general use, ball bearings are made to standards established by the Ball and Roller Bearing Committee of the S.A.E., but machine tool spindle mountings require greater accuracy. Bore, outside diameter, eccentricity, and face runout must be less than half the S.A.E. tolerances. When it became commercially feasible to manufacture bearings within the desired limits, the problem resolved itself into the design of adequate mountings for preloading. In this regard, experience has taught us several things:

1. The fewer number of bearings and the shorter spindles that are used, the greater the assurance of satisfactory results and low cost.
2. The mounting that superficially seems most econical may be expensive to service.
3. The preloading means should be adjustable to meet operating conditions and possible variations in the mounting parts.
4. To preload bearings before assembly is generally impractical.
5. Assembly of the spindle and its bearings, before mounting them in the housing, is desirable.

Most machine tool spindles have considerable length in proportion to their diameter and require more than two bearings. General practice is to mount a pair of preloaded bearings near the spindle nose and a single bearing at the back end. To obtain the greatest rigidity, the front bearings should not be too close together. However, if they are too far apart the preloading may be disturbed by temperature changes. New Departure practice is to make the center to center distance between bearings equal to the diameter of the ball circle. Clamping the bearing

to the shaft through many intermediate spacers or gears is a source of trouble. Any out-of-squareness may become an accumulated error which causes distortion of the spindle nose when the clamping nuts are tightened.

Preload may be secured by springs, by spacers between the races of adjacent bearings, or by adjustable threaded members. Each method has been successfully employed, but certain defects in the first two led to our standardization on the last named. Several designs taken from actual installations may serve to illustrate the advantages and weaknesses of these types. High speed spindles present a problem of lubrication not covered in this discussion.

In Fig. 1, the application of helical springs to produce preload is shown. Two opposed angular contact bearings are used, the outer race of one being mounted in the housing while that of the other is pressed into a sliding sleeve. The springs, located axially between the sleeve and a spacer plate create an initial thrust load. The back end of the spindle is supported by a single row bearing with its inner race fixed to the shaft and its outer race floating in the housing. At first glance, this solution may appear satisfactory, but because of spring flexibility, the degree of preload is not permanent. All three inner races are held in place by sleeves clamped with a single nut. If the facing of these parts is not exactly square, spindle runout may result. The design is simple to assemble.

A modification of this construction is shown in Fig. 2. A threaded collar on the sleeve supporting the back-end bearing serves to produce and adjust the main preload. The springs in this design are mounted somewhat as in Fig. 1, but serve merely to take up radial clearance. The function of the center bearing is to support the shaft and dampen vibration rather than to set up the preload. The clamping nuts are located to minimize spindle distortion in assembly and are so arranged that the bearings may be assembled outside the housing. The weakness of this arrangement is the distance between the two preloaded bearings which permits expansion and contraction to disturb the initial setting. The spring load on the center bearing can only be determined experimentally.

Fig. 3 discloses what at first may appear to be the best design of all. The front pair of bearings are preloaded by spacers between the inner and outer races. It is theoretically possible to make angular contact bearings in which a definite offset between inner and outer races will produce a predetermined thrust load. Such bearings mounted with properly sized spacers would meet operating requirements were there no variations in dimensions. Slight inaccuracies in the spacers or housing will, however, alter the internal fit of the bearings causing an unknown preload. Since practical manufacture necessitates machining tolerances, this disadvantage is serious. The mounting has a further drawback in that no adjustment can be made in the preload without complete disassembly of the spindle. Preloading the bearings outside the housing permits expansion of the outer races which may cause variation from the computed pressure.

The rear of the spindle is mounted in accordance with best practice. The angular bearings are made to have

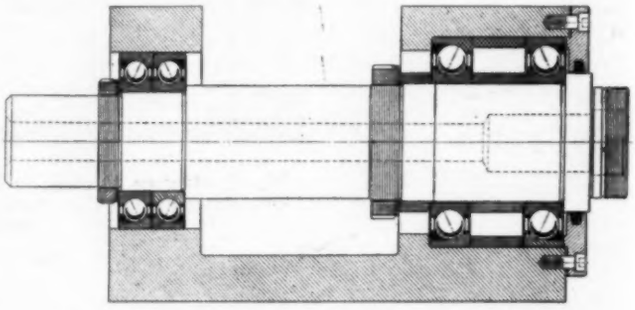


Fig. 3 — This simple and effective construction requires extreme accuracy in machining to obtain the desired preload. Adjustment is difficult

a slight preload when clamped to the shaft, producing minimum radial clearance and maximum rigidity. The only criticism is that the outer races are in direct contact with the housing. Ordinarily this arrangement is satisfactory, but if the housing is bored oversize, it will have to be bushed, or special outer races used. Special bearings are usually hard to get when replacements are needed.

The design illustrated in Fig. 4 uses a pair of equal sized angular contact bearings at the nose and a smaller duplex angular contact bearing at the back end of the spindle. Both larger bearings are mounted in sleeves with threaded engagement between them. Since the front sleeve is rigidly secured in the housing, rotation of the rear sleeve sets up a preload by forcing the two outer races apart. Owing to possible eccentricities in the adjusting sleeve or the outer race of the second bearing, the point of correct adjustment is hard to attain. The design is cheap to produce, and once properly set up, gives satisfactory service but does not afford the most advantageous solution.

The application in Fig. 5 allows complete bearing and

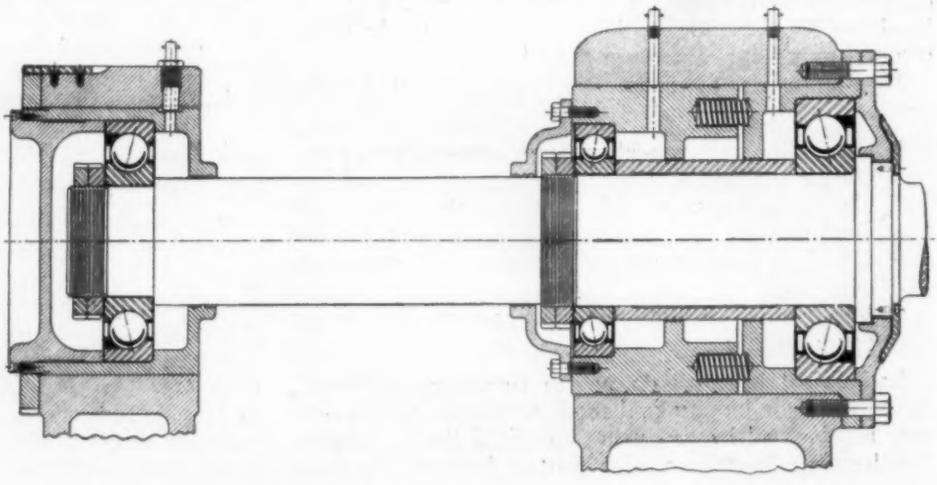


Fig. 2 — When the two outer bearings are preloaded, temperature variations are magnified. The springs in this design merely take up the clearance in the intermediate bearing

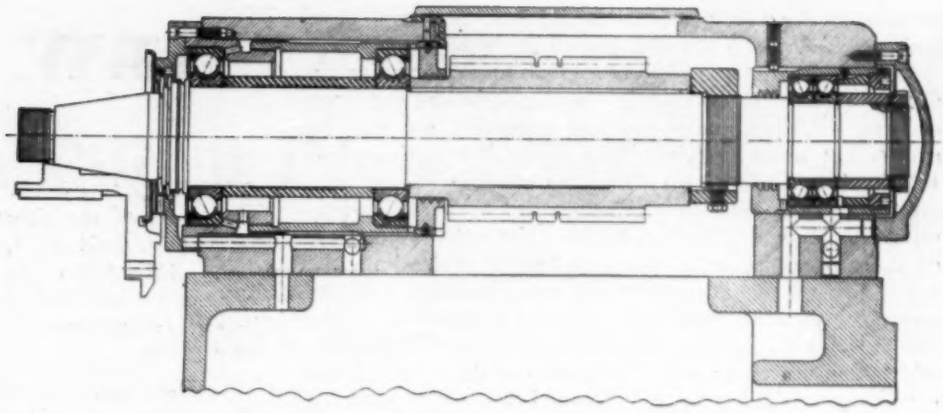


Fig. 4 — Slight eccentricities in the outer race or the adjusting sleeve of the second spindle-nose bearing may be detrimental to precise load settings

spindle assembly on the bench. Manual preloading is obtained by forcing the second bearing into the main sleeve by a threaded nut and spacer, neither of which is part of the sleeve itself. The disadvantages are the slight increase in manufacturing costs over previous mountings and that the manual preload adjustment must be made outside the housing. This precludes variation of the bearing setting to suit operating conditions. In making the adjustment, the outer races of the bearings and their sleeve may be disturbed causing inconvenience.

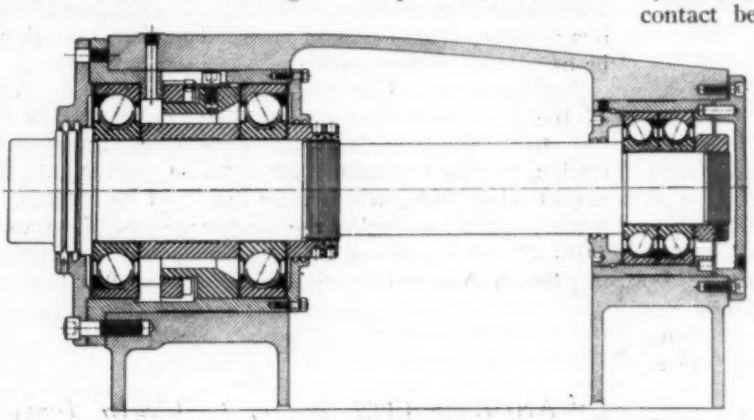
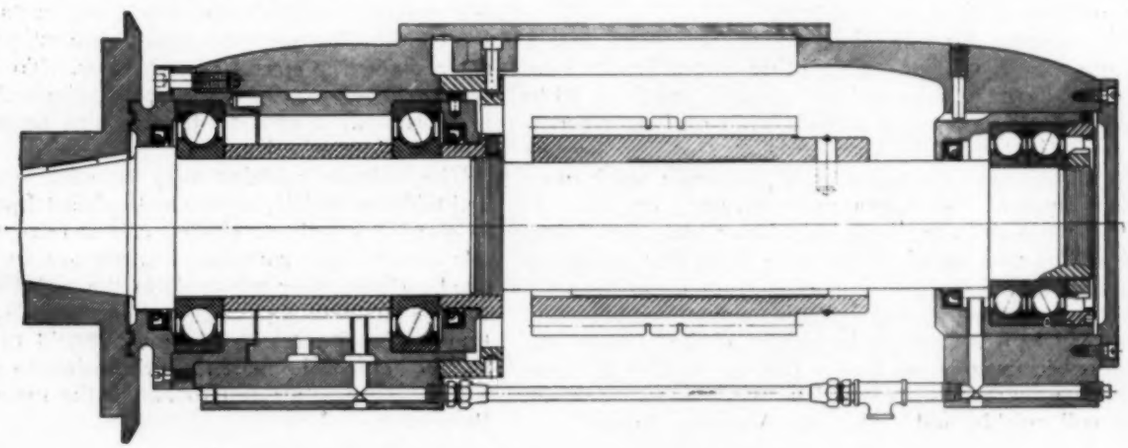


Fig. 5—These bearings must be preloaded before assembly in the housing, preventing further adjustments to meet operating conditions. The duplex back-end bearing is excellent

In Fig. 6 is illustrated a design that overcomes the objections of previous mountings. As before this is an angular contact three-point arrangement using a slightly preloaded duplex bearing at the back end. This is mounted in a sleeve which has a sliding contact in the main casting and which acts as a lubricant retainer, protecting the bearing against foreign matter. The use of the sleeve allows compensation for errors in boring the main casting and ease of replacement if this bore should change over a period of time. Rotation of the sleeve from friction of the seal or any other cause is prevented by a setscrew. On the front end, two equal angular contact bearings are spaced the correct distance apart on the shaft with a minimum number of clamping parts. The inner races are held by a nut with a ground pilot fitting the ground shaft surface. This prevents cocking action even with loosely fitted threads.

The outer races are mounted in two sleeves, the front one being bolted to the housing and the rear one doweled to it so it may be moved endwise but not rotated. The end of this sliding sleeve is threaded on its outside diameter and is engaged by a nut bearing against the machined face of the main casting. Rotation of this nut secures preload adjustment with the spindle in the machine. The bearings may be assembled on the spindle and in the sleeves before loading. The sleeves need not have a press fit in the housing because their expansion when loaded will absorb the slight radial clearance. The bearings are protected against the entrance of foreign material. This design meets the desired conditions of

Fig. 6—This design embodies ease of adjustment, low cost, and accuracy, the characteristics of a satisfactory mounting



variable preload, ease of assembly, low mounting cost, and assurance of continued accuracy.

Is there any danger of over preloading bearings by too drastic a thread adjustment? In Fig. 2, where the front and rear bearings are of unequal capacities, one may be overloaded when sufficient load is applied to the other. In Fig. 4, a variation in mounting conditions may produce excessive preloading although this is more theoretical than practical. In Fig. 6, since the outside diameter of the sleeves is not a press fit before preloading, the sensitivity of the adjustment is not disturbed. If the assembler jars the parts with a babbit hammer to assure that there is no binding, he can readily feel the point at which the races and balls come into contact. Then the necessary preload may be obtained from the pitch of the threads and the bearing characteristics. Another method is that of gradually tightening the nut until an increase in spindle turning torque is distinctly noticeable and giving additional turns to secure the desired preload.

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Why a Gas-Engine-Driven Tractor? *Discussion*

N. G. MORGAN
Morgan Brothers

THE article, "Why a Gas-Engine-Driven Tractor?" by C. M. Hermens, which appeared on page 1023, Vol. 72, of the *American Machinist*, calls for protest. Perhaps only those of us who have used internal combustion tractors from the beginning can appreciate what they have done for agricultural machinery. Even though they have their disadvantages, and we wait hopefully for that "something better" which the future may bring forth, they are now so far ahead of anything else of the kind as to be in a class by themselves.

Steam never was successful as a source of tractive power on the farm. In days gone by, horses and mules furnished this type of power and steam did the belt work. Other farm machinery was limited in application, in most cases being used only a few 10 or 12-hour days per year. The theory was that this limited use would not justify a high first cost, consequently most implements were very poorly and cheaply constructed.

The first tractors powered with internal-combustion engines, though crude and inefficient, were found to be practical for both belt and drawbar work. Consequently they had a relatively wide field of usefulness, and there was some incentive for improving them. The result is our modern, efficient gas tractor.

The changes brought about by tractors have had a definite effect in improving other farm implements. Working days could be and were lengthened from 10 to 24 hours. Frequent rest periods were no longer necessary, so time spent in servicing and repairing became simply lost time. Lost time itself became a much more serious matter. With equipment covering from one to five or more acres per hour, each hour lost might mean the loss of part or all of the crop from this acreage—a serious matter.

Whenever tractors can be built, using steam or any other source of power, to be lighter, cheaper, more efficient or dependable, of longer life, or capable of more nearly continuous operation than the present machines, they will quickly find a place on American farms.

NEW BOOKS

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AMERICAN FOREIGN TRADE IN 1930—*Official report of the Seventeenth National Foreign Trade Convention, held at Los Angeles, Calif., May 21-23, 1930. 457 pages, 6½x9½ in. Cloth board covers. Indexed. Published by the National Foreign Trade Council, India House, Hanover Square, New York, N. Y. Price $2.50.*

For those manufacturers who are selling or desire to sell a portion of their products in foreign countries, this complete record of the proceedings and papers delivered at this year's foreign trade convention is well worth close study. The keynote of the 1930 convention was that American foreign trade is now stable and not subject to the drastic rises and falls of former years. This means that any manufacturer who is earnest about foreign selling must keep in line with the market and not trust to sporadic selling methods. The clear summing up of various aspects of the trade as recorded in this book should be of service in this respect.

Besides a record of the proceedings and the names of the 2,185 delegates present, the book gives in full the thirty-eight addresses on finance, investments, credits, trading methods, transportation, export aids, and export advertising, which were delivered by outstanding trade experts, and also the discussions of the papers. Most of the important markets are touched on, including South America, Africa, Europe, and Australia.

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STANDARD COSTS—*By G. Charter Harrison. Three hundred eight 5½ x 8⅜-in. pages. Indexed. Published by the Ronald Press Co., 15 East 26th Street, New York, N. Y. Price $5.*

That a cost system should be viewed as a source of profit rather than expense is strongly emphasized in this manual. The scientific basis of industrial accounting practice, the technique of standard costs, and the installation of specific systems are described in detail.

The present day realization of the paramount importance of cost accuracy makes this volume of timely interest. The author not only details the mechanics of costing but stresses the means of utilizing the results. He provides methods for predicting costs in advance, for checking actual costs against pre-estimates, and for determining the causes of variations. To achieve these results, he adopts the formula, long the tool of the engineer, somewhat new to the field of accountancy, but none the less effective.

The volume contains very complete graphic charts and tables exemplifying the methods set forth. The value of simplicity and low clerical cost is recognized. Methods of exposing sources of waste are carefully developed. Distinctions are made in the systems suitable for various kinds of organizations. Mr. Harrison's contribution to the literature on costing should prove of value to any industrial concern which wishes to modernize its accounting practice and to obtain the maximum benefit therefrom.

Saving Dollars in Punch Press Work

FRANK A. STANLEY
Consulting Mechanical Engineer

PUNCH PRESS work offers many opportunities for misunderstanding that not only mar pleasant relations but frequently cost both sides many hard-earned dollars. After the customer pays for the dies and perhaps for the set-up of the press he frequently expects the work at too low a cost. With a press running at 120 strokes a minute he expects at least 6,000 an hour. And even 50c. a thousand, plus the material, seems very high. He overlooks the fact that short runs and lack of continuous business keep the presses idle much of the time.

Comparatively short runs in all except large plant production account for the prevalence of hand feeding in punch press work. About 3,000 pieces per hour are a good output for simple blanking operations, although much depends on the size of the piece. For, while the press punches a piece at each stroke, the larger the piece the more time is lost in changing from one blank strip, or sheet, to the next. Automatic feeds can save much time, but comparatively few runs are large enough to warrant their use.

Second operations, where work must be positioned by hand, cut down the output to about half that which can be secured with automatic feed, but the skillful die maker can frequently offset this to some measure by using gang dies where competition in die cost does not prevent. It requires a nice balancing of costs to decide when to use simple or gang dies.

One very successful specialty shop manager makes it a practice to build single tools for parts that are to be run in lots of 250,000 or less. For larger quantities he uses double or gang dies, but hesitates to do so unless there are likely to be other long runs as well. Gang dies usually cost at least twice as much as single dies, largely due to the increased accuracy where two sets of tools are incorporated into one set of die blocks. This manager seldom uses gang tools, and while his operating costs are somewhat higher, his success indicates the wisdom of his policy.

Charges for straight blanking and for second operation work in a Pacific Coast shop vary from $1 to $5 per thousand. These include small and medium sized work. In some cases where the work is small and easy, a rate of 50c. a thousand covers the cost. But the non-productive time of the punch press must be given careful consideration as to its bearing on the day's output for the investment.

The time required in punching is also influenced by the way in which the piece is located in the strip of stock. Then too, the size is a big item in cost. A 4-in. piece runs less than three to the foot, or less than 30 to a 10-ft. strip. A half-inch piece gives over 200 to the same strip. The difference in productive labor before changing stock is an item to be carefully considered. Straight or angular arrangement of the piece in the stock is a point where the good die maker can help in saving time and money.

When estimates on die costs vary from $750 to $2,700,- as has recently happened, it is well to look carefully at what the various bidders propose to do before placing the bid. The lowest die cost may increase the cost of the work to a prohibitive point. On the other hand the highest bidder may intend to build more elaborate dies than the case warrants.

It must also be remembered that work from second operation tools cannot be estimated on the same basis as from blanking dies. Getting work into the dies properly and safely slows down the output appreciably. Shops running great varieties of second operation work estimate from 20 to 30 pieces per minute, less than half the average for blanking. When the piece must be accurately located with respect to a previously punched hole or point, the production is less.

Some shops use an inclined press with a chute which slides the work into position where exact location is not necessary. This helps to prevent accidents to fingers. Others combine first and second operations in a gang or combination die where possible and profitable. It cannot, however, be done as well as where a piece must be shaved all around or with a cup that is drawn into a shell. While combination dies are expensive they take the place of two separate dies and save time in press work.

Drawing is much slower than blanking. From 15 to 20 per min. is considered a good output for shells or ferrules of about 2-in. diameter by 2 or 2½ in. long. Getting the cup out of the dies slows down the press, no matter whether the die is in the slide or in the lower block. With such work as small arms ammunition, the quantity permits the use of dial or other feeds, and the press can be run much faster.

Setting-up charges are frequently a cause of dispute, but seem better than trying to figure them in overhead. Many shops make a flat charge of $2, based on an average time of one hour. Others make no setting-up charge on runs of 5,000 or over. Charging for servicing or keeping tools in condition is also a question in punch press shops. Many feel that short runs do not ordinarily necessitate grinding and that long runs justify the press shop in assuming this expense.

The Foreman's Round Table

IN THE DRIVER'S SEAT

"DROP in and see me a little before lunch time, will you, Ed?" Al asked as the two friends met in the drafting room. "I want to talk to you about Sam Becker."

"Certainly," replied Ed. At about 11:45 he walked into Al's office. "What about Sam Becker, Al? I hope there is nothing wrong."

"It's this, Ed. To be blunt, I've got to make up my mind to fire him. He's a good friend of yours, and I hired him on your sayso, but I can't see any other answer."

"Gee, Al, I'm sorry this happened. Sam's a real good guy when you know him. Do you think if I talked to him, Al?"

"I don't need to answer that question, do I?"

"No, and I apologize. He's got to act right because his foreman tells him to, not because his friend asks him to. What's the trouble anyway, Al?"

"You can guess. He presumes on the fact that you and I are friends. He is sloppy in his work, and if I talk nice to him he smiles the rebuke away. If I bear down, he sulks. I hate like blazes to let a man go, but I've had just about plenty."

"I know you have, old man. When you let anyone go, he's hopeless. You know what I think about a foreman running his own department without outside interference. But can't you, without violating that principle, get some advice from Williams. I hate awfully to see Sam go."

"I did see Williams, but I didn't get anywhere. He said that some men did not understand soft talk, and that others mistook mildness for weakness—that the problem was one of how much training I considered I owed a man and how much nervous energy I was willing to expend in doing it. On the other hand I must be sure, he said, whether I fired a man because he was not amenable to training or because he irritated me."

"Williams always has a queer way of looking at things. No square foreman ever fires a man for personal reasons."

"That was my idea, too. But if Becker was inefficient, I should have fired him long ago. He is now in a state of, what Williams calls, passive resistance, and maybe that's what I would fire him for. I have an idea that Williams is watching to see what I will do; in fact I feel sure of it, because he told me about two foremen that he had under him once. Both of them, he said, were competent and square shooters. One was nervous and dynamic, and to be sure he would not fire a man unjustly because of his own temperament, he never fired one. He boasted that he could train any man provided the man could stand the training. If the man found the training too strenuous, he could quit, but he wouldn't be fired. His policy of camping on a man's tail and bawling him out in the department and probably laying him off for a week, gave him the reputation of being a hard boiled guy and a driver. Nobody seemed to notice that it was only a few incompetents that he jumped, or to realize the toll he was taking on his nervous energy. The general verdict was that he was smart, but a damned crank.

"In an adjacent department was an opposite type, square, phlegmatic, and easy going. This man would call an offender into the office and scientifically flay him without raising his voice, and then probably fire him. This man's reputation was much better than the other man's and nobody noticed that his turnover was four times that of his neighbor, because he would not assume any responsibility for training a man, and because he fired a man instead of laying him off. Williams' telling me that has me guessing. What's the answer?"

Is it better for a foreman to save wear and tear on his nervous system by ignoring a man's errors until he feels justified in firing him, or is it better to punish the man for each separate error that warrants it, at the cost of nervous energy and reputation? From the man's point of view, does he feel safer as regards his job, with the first or the second type of foreman?

Suggested by W. J. Owens, Foreman, Newport Rolling Mill Company.

▸ ▸ ▸ Discussion of Former Topics

From Soup to Nuts

While I thoroughly appreciate the natural reaction of the shop man against dress functions, and even sympathize with his point of view, I believe he is all wrong when he insists on carrying it into practice. Invariably, he falls into the obvious critical comparison of the executive's lack of knowledge of shop equipment and manufacturing details, arguing that this if true, is all the justification he needs for refusing to appear at a social function.

It would hurt this shopman's pride and arouse his resentment if one were to tell him that the executive, whose dress clothes he so despises, is more of a man than he is, yet it is true. For the executive does not run away from shop contacts; he is willing to ask questions and match opinions in the foreman's favorite stamping ground, even though he is at a disadvantage. An executive does not necessarily know as much shop detail as a foreman, but he does know enough to appreciate the shop viewpoint. Yet his critic, adamant in his own self-esteem, feels perfectly justified in refusing to meet the executive in any surrounding where the executive may have the natural advantage.

After all, it is the foreman or mechanic who should have the natural inclination to rise. It means more to his future to learn the language, customs, and viewpoints of the executive, than it does for the executive continually to cultivate the shopman. It is much better for the shopman to talk up to the executive, rather than for the executive to talk down to the shopman.

Easy familiarity with the executive train of thought and method of expression leads to promotion—not through drag, but through self-advertisement. Why should an executive, looking for a man to promote to a higher vacancy, pass by the man he has learned to know, by social contacts, as possessed of the qualifications, while he roots around and tries to smoke out some other shopman who may or may not have the perquisites, but who insists that the boss come to him if he wants to do him a favor through promotion.

—Eli Smith, *Engineer, Russell & Company.*

Boss, or Advisor?

"Boss"—I detest the word. I have been a machine-shop superintendent for the past ten years and I sincerely hope that I have never been a boss.

To start with, we are all human, regardless of what position or rank we may hold. We all possess the same feelings and are subject to the same pleasures or embitterments. Work should be a pleasure; to have that work appreciated should be a greater pleasure.

In my experiences with men, the man that needed a boss never lasted very long on my payroll, but the man whom I could convince that he was working with me and not for me usually became a veteran workman.

Many a time I gave out a job, instructed a workman to perform a duty a certain way only to have him find a better method and discuss it with me. Should I hinder the development of a new method just to show a man who was ambitious and creative "who was boss?"

Many times my ideas of performing a certain job were better than the workman's, but if he were at all on the right track I would give in, because I knew I was making a better workman for future jobs.

There are times when it may be necessary to be hard-boiled, but I have usually found that diplomacy and tact work much better and yield greater returns.

—C. H. Hays.

Experience or Authority?

Admittedly this drill-press "high-brow" knows his job; the trouble is he knows it too well! The job is too small for him.

To discover ability in subordinates and to give it scope is one of the functions of an executive. The whole community is helped if ability is guided into channels where it will be most useful. There are, very likely, more important jobs to which a discerning foreman could promote such a man, with advantage to all concerned.

On the other hand, management, specialization, and mass-production require that each worker be squeezed, if necessary, to fit exactly and not to exceed his rôle. Otherwise the whole organization functions badly. If every worker is going to dictate just what he shall do, the shop will become a battlefield.

If the foreman cannot give that drill-press hand a better job and take advantage of his abilities, or mold him to fit the job he already has, then he may feel that he has no option but to "fire" him. But there are many compromises between those alternatives.

—A. W. Knight, *Suffolk, England.*

Playing Favorites

Playing favorites, in its worst form, is objectionable and does much harm, but it is necessary to treat different men differently. Give some men an inch and they take a foot; others have a sense of fairness and know how to give and take. With some men it is quite safe to extend certain privileges because they know how to appreciate them and take the first opportunity to return the favor. Give a similar privilege to another man and he will quote it as a precedent to demand the same thing as a right. Such men will always find reasons for believing that the foreman is playing favorites whether he is or not, so why bother about their opinions at all?

—H. James, *Birmingham, England.*

Honest Graft

The character of the meetings will have some bearing when deciding whether assistant foremen should be paid for attendance at foremen's meetings. If the subjects dealt with are mainly concerned with problems arising

in the shop on the firm's own product, then attendance can be considered overtime, and payment should be made accordingly. If the subjects cover a wider range, applicable to shops generally, and may be considered in the nature of general engineering education, then most men would be willing to attend without thought of payment to be received. Information gained at these meetings can never be considered as of advantage to one side only; it is distinctly to the advantage of the firm if the subject matter is of immediate application to work in hand, but it also helps the man in his job. Even information which may not appear, at the time, to be of much use, may save considerable time and trouble on some future occasion.

As to whether a man should be paid for going to school—why not? Is it not common practice for an apprentice to be paid for attendance at technical school, and cannot an assistant be regarded as an apprentice foreman? —ALBERT F. GUYLER, *Notts, England.*

Vacations Again

There is no good reason for giving office employees vacations and the shop men none, unless it is considered a greater strain to use the brain than the hands. The present condition is probably an outgrowth of a practice started years ago when the owners took short periods off for recreation. The idea spread first to the office force, since they were fewer in number than the factory, and in many cases the work could be arranged so that no interruption occurred and no expense was added to the payroll.

The granting of vacations with full pay to factory employees is now becoming more common, especially with large concerns. The idea behind the plan is the reducing of labor turnover. Vacations usually start three to five years after a man starts with the firm, only one week being allowed. Men who have completed ten years are given two weeks with full pay.

The adoption of a plan of this kind requires a broad-minded directorate and a prosperous business. It is encouraging for shop men to note that the trend is along these lines, because the majority must feel that they have earned a paid vacation as well as have the office workers.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

No Parking

If the factory is in the crowded section of a city, where land is at a premium, it is not reasonable to expect the company to purchase or lease land and erect garages solely for the convenience of its employees. Under such circumstances, there are usually commercial parking spaces or garages available, and the management might try to negotiate a favorable commutation rate.

If the factory is in the suburbs or a small town, and there is room within the factory grounds, or leasable ground adjacent to it, the management should be willing to stand the cost necessary to make this space available. Providing parking spaces under cover, unless there is already a building which is adaptable, should not be expected of any concern. —EARL L. FAIRALL, *Engineer, Naval Aircraft Factory.*

High Rates

The old dictum "Fire the fools and pay the good men handsomely" is sound sense and an essentially economical proposition. Here is no place for sentiment: this is a business deal, both parties doing the square thing. What brings grist to the company mill should certainly bring grist to the individual.

The workers are rightly encouraged to realize that what they do has its influence on their own fortunes and on those of the company they serve. Where the "square deal" is the keystone of the structure, self and company interests are one and the same.

—W. R. NEEDHAM, *Stafford England.*

Do Errors Cancel Each Other?

It is futile to argue against some of the principles of modern industry where mass production, economy, and efficiency have earned a proper place, but when some individual takes steps to go just a little too far, it is time to criticize.

To have an organization working to the highest degree of efficiency the one thing absolutely essential is to have the workman's mind as near contentment as possible. No one can deny this, for with ease of mind comes the best work, a minimum of accidents, and the least error. So when an executive of a concern goes so far as to rule that a costly mistake in a man's work shall be paid for out of his weekly wage, he is doing his company a great wrong. Nothing can be more destructive than to place upon the employees the strain of fear that their weekly envelope will be reduced if their work is in any way faulty. —ROCKWOOD T. ROBERTS, *B. & A. Roundhouse, Worcester, Mass.*

The Community Fund

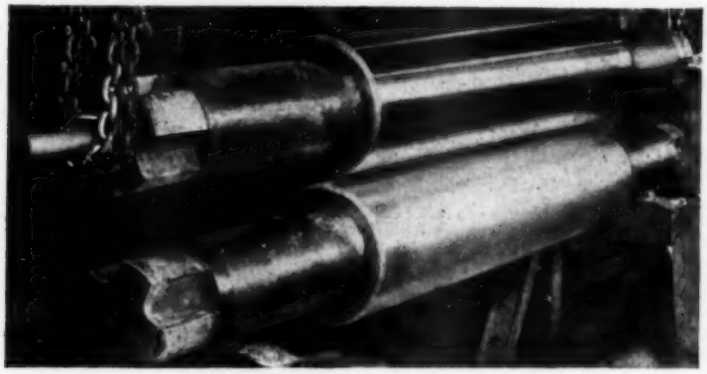
I agree that every man should be obliged to give a percentage of one day's pay to a cause such as this—one that comes but once a year and does a whole lot of good. It will not be working a hardship on any individual to give this small amount; for if one is so badly off that he cannot afford to give, and does not as the case states, own a car or piano, then there is a practical chance for those who can give, to help out right at home.

Why should the rich do all the giving. Have they not earned the right to spend their money as they please, as well as the working man? That is a purely radical idea, broached by those who, if they ever reach a stage of affluence, will orate just as hard in the other direction.

As for the matter of well paid secretaries, does any man imagine that this position, one that calls for tact, ability to meet people, and vision to see things in their true light, is one that any person can fill? I am thankful that I have not reached the stage where I think that I can do anything that the other fellow can, am worth as much if not more than he, and that the grass is always greener in the other fellow's yard. I have worked for small wages in my apprentice days, and my people were of only moderate means; but we were always able to see that the other fellow's troubles were worse than our own.

—CHARLES R. WHITEHOUSE, *Standards Engineer. The Holtzer-Cabot Electric Company.*

CHROMIUM PLATED MOLDS



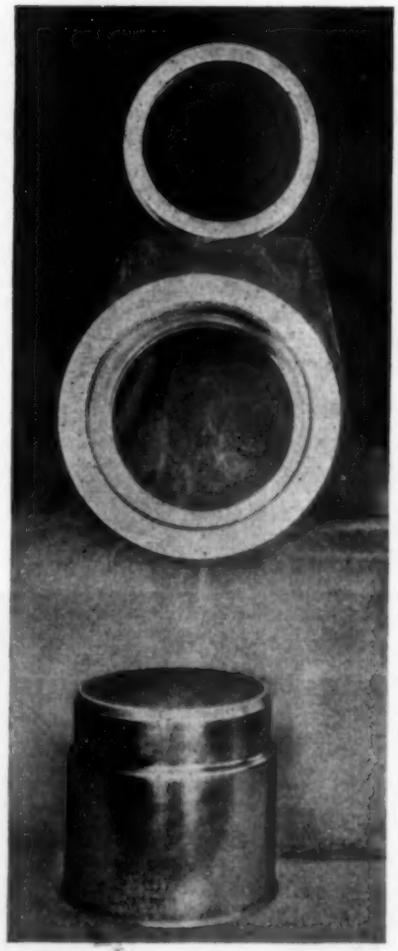
A hard surface for these rolls used in making cold rolled sheet is obtained by chromium plating

H. E. STOCKFISCH

Material and Process Engineering Department, Westinghouse Electric & Manufacturing Company

RESISTANCE to wear is the principal justification and value of chromium plating in molds. Plating of this metal combines hardness and low friction resistance. It offers high resistance to staining and tarnishing, and its adhesion to the mold is not reduced by temperature changes, nor does it chip, crack, or peel, either with sudden temperature changes, as in glass molding, or under heavy pressure, as on plated steel-mill rolls, or when subjected to extreme abrasion, as in dry brick molding.

In glass molds, for both blown and pressed objects, the combination of long wear, preservation of polished surface, elimination of lubricants, and ease of stripping, makes chromium plate an ideal material. The high temperature of the molten glass, about 2,100 deg. F. does not reduce the adhesion of the plating. The high temperature and speed of modern glass molding operations make this application one of the most severe. Since chromium plating makes it possible to eliminate the use of oil lubrication in most glass molds the troublesome necessity of frequent cleaning is avoided. Marked economies also result, because the life of molds is increased from four to eleven times before replating.



Chromium plated steel mold for forming special tubes of Micarta

Because of the qualities mentioned, many firms making lustrous products quickly adopted chromium plating. In many instances this was done without attempt to differentiate between a very thin deposit, 0.000008 in. thick, for appearance, and a heavy deposit, 0.004 in. thick, for wear. As a result unforeseen difficulties were encountered, and chromium plating was quickly abandoned because it peeled, chipped, or wore through in a short time. This was true particularly in the glass industry.

Of the several hundred companies that started to plate glass molds, only a few continued to do so after the first few molds were tried and found so disappointing. Present users are either having their molds plated by specialists or are doing the work themselves after much expense and labor in obtaining the required information. Most firms prefer the former course believing it to be more economical.

An interesting use is in dry brick molding, where the combination of high pressure, extreme friction, and scratching is encountered. It is customary practice to line the mold with casehardened steel plates for wear resistance. This is fairly satisfactory, but the plates still wear. A

chromium coating deposited on these plates increases their life considerably, and there is a decided possibility of eliminating the plate arrangement and, instead, of depositing the plating directly on the faces of the heat-treated steel mold block.

In the plastic materials industries chromium plating has been found very desirable in molds for such chemically active products as hard and mechanical rubber goods, which contain sulphur; for synthetic resin materials of the laminated and composition types, which often contain carbolic acid; for cellulose derivatives, such as celluloid, which contain combined nitric acid; for compositions containing pitch or rosin; or for any of a multitude of plastic materials.

Table I—Composition of Chromium Plated Molds in Successful Use

Material	Per Cent							
	Carbon	Mn.	Si	S.	P.	Ni	Cr.	V
Chrome Steel No. 11	0.50	0.60	0.20	0.04	0.04	...	0.9	0.2
Tool steel No. 4	0.90	0.45	0.20	0.02	0.02	...	....	...
Tool steel No. 9	0.55	0.55	0.20	0.04	0.04	1.5	....	...
Cold rolled	0.15	0.40	0.20	0.04	0.04	...	....	...
Cast iron	3.00	0.50	2.00	0.04	0.04	...	....	...
Cast steel	0.25–0.40	0.60	0.20	0.04	0.04	...	....	...
Stainless steel	0.25	0.50	1.25	0.04	0.04	...	13.-17.	

This application takes advantage of the wear resistance of chromium together with its non-staining quality. Because of the chemical nature of the products, and the frequent temperature variation in the molding cycles, from that of steam at high pressure to cold water, resulting in repeated expansion and contraction of the molds, there is severe service in molding materials of this type. Chromium adheres perfectly to the steel molds, retains its clean surface untarnished, and resists scratching. The Westinghouse company has used chromium in plastic materials applications up to two years continuous molding without refinishing and without tarnishing. The plastic materials molding works has applied chromium to over one hundred molds and in every case these have improved the appearance of the products and frequently have reduced mold handling costs, usually because of elimination of lubricating requirements and related troubles.

Steel is used almost exclusively for molds. Table I gives the average compositions of some chromium-plated molds which are in successful use in industrial applications.

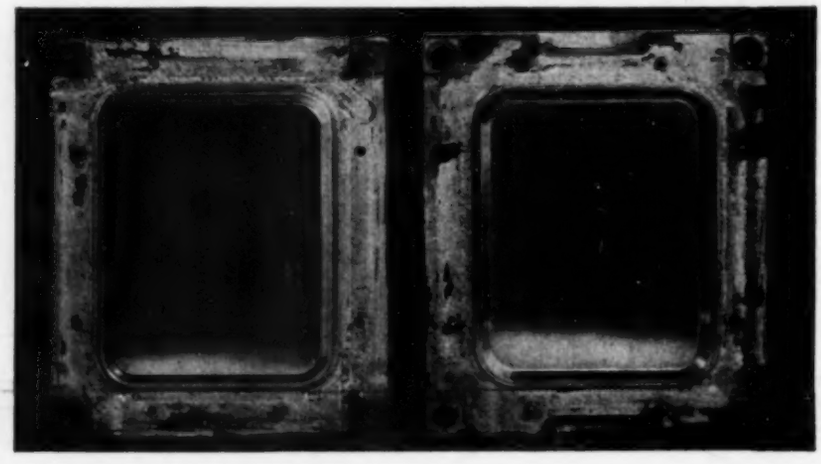
Manganese is present in all compositions and is added for its deoxidizing and sulphur-controlling effect. Phosphorus and sulphur are kept below the figures given. Nickel, chromium, vanadium and silicon are added to improve physical properties. In addition to chemical composition, one must consider the physical nature of the metal, especially its hardness, impact strength, and metallographic structure. Table I indicates that a fairly wide variation of composition can be used for molds to be plated.

Hardness of molds depends upon composition, heat-treatment, size, and shape, and usually is between 33 and 62 Scleroscope (Brinell 223-375). In the same mold, thick sections will be less hard than thin sections, because of the slower heat loss rate in the heat-treating process. Carbon is the main component having an important influence upon hardness, and its action is dependent upon the heat treatment.

Plating often increases hardness. A mold part without heat-treatment showed 151 Brinell before plating, and 172 after plating. A heat-treated mold part showed 766 Brinell before and after plating. A piece of case-hardened, high-manganese steel showed no change after plating, the values found being 848 Brinell. On extremely hard surfaces there is no change in hardness, but on softer steel there is an increase. In these cases the coatings of chromium were from 0.0005 in. to 0.00075 in. thick. Generally speaking, wear resistance of chromium plate is increased as the steel becomes harder. Moreover, a steel piece stripped of its chromium will resume its original hardness. R. J. Piersoll, in the transactions of the Electro Chemical Society, Vol. 56, 1929, pp. 371-377, gives a very interesting discussion of hardness and a method of determining wear resistance.

Poor results, often causing chromium plating to be rejected as a mold material, frequently arise because the shape of the mold affects deposition, but if care is exercised and a study to determine correct conditions is made, any mold can be plated, independent of its shape. Ordinary flat and curved shapes with large matrices and openings are easily plated uniformly. It is in an irregular shape that trouble occurs; for example, in a mold having a deep narrow hole or a slot, and with sharp corners, perhaps with several pins, or a deeply recessed engraving, as in a trade mark. Pieces such as this require a refined plating technique in order to get the chromium to deposit uniformly over the whole surface. This is done either by varying the anode shape, the bath composition, the temperature, the current density, the rate of current input, whether constant or increasing or decreasing, and by other similar means. Combinations of these items are frequently necessary.

Sharp corners are an often encountered source of plating difficulty, as they form a focus for the current stream, which results in very high current density above the sharp edge, and a lower current density on the surrounding area. The effect of this is to build up a thick

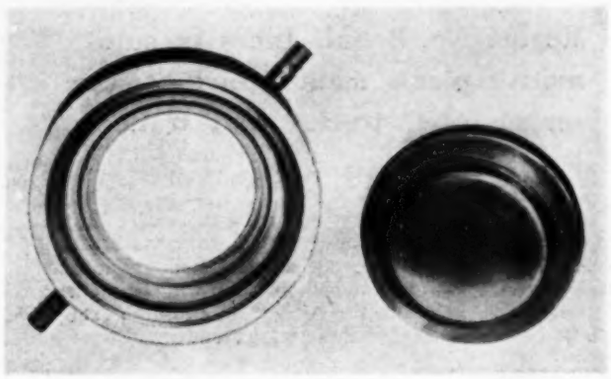


Molded serving trays of Micarta are given a lustrous finish by having the surface of these molds chromium plated

plating adjacent to the corners and one gradually becoming thinner on the more remote areas. This trouble is usually remedied by suitable design and location of the anodes or holding clamps.

There are numerous other difficulties in plating molds, but as stated above, they can be overcome if a search for correct plating conditions is made.

In all cases of the author's experience, chromium has been plated directly on the steel without the use of copper (except on hot-rolled steel, which should be avoided



Glass dishes are formed with this chromium plated mold

for chromium plating work), or on nickel undercoats, with complete adhesion. Undercoatings of copper and nickel are used only when a high luster is needed on steel which does not conveniently take such a polish, but it should be avoided, if possible, because it is desirable to deposit directly on the steel. The U. S. Chromium Co. of Pittsburgh have been very successful in wear-resistant plating on industrial applications, and the author wishes to acknowledge their co-operation.

Chromium plating eventually wears away. The parts of the mold receiving most friction, as on a short radius corner of a matrix opening, usually fail first. This usually can be detected by visual examination, but, if a check is desirable, by swabbing the plated area with a dilute (10 per cent) solution of blue copper sulphate crystals, which will deposit copper on the bare steel exposed.

It is unwise to plate over the old chromium surface, as the new coat will have poor adhesion, and will not be an especially hard deposit. The old chromium plating can be removed by electrolytic means, as by making the mold the anode in an alkaline bath, thereby dissolving the chromium completely without affecting the base metal finish if the current is shut off when the coating is dissolved. Chemical removal of the chromium sometimes is accomplished by the use of an acidic solution, but unless special precautions are observed the metal of the mold is likely to be attacked. Such treatment, if used, should be followed by washing, drying, and, if necessary, repolishing, or whatever finish is desired. The mold then can be replated and put into service as before.

Electro-chemical stripping action depends upon the formation of soluble chromates from the chromium plate through influence of current and alkaline solution. Chromium plate does not dissolve by simple immersion in the alkali solution. By simple immersion in muriatic acid solution, however, chromium will strip very easily, forming soluble chromium chlorides.

Molds for jobs in which appearance of the molded object is a consideration have their faces finished either semi-gloss, high gloss, or special. These finishes are reproduced very faithfully by the chromium plating; in fact chromium plating accentuates small differences in appearance and frequently shows up irregularities of finishing. The mold finish is imparted to the object when the material molded becomes plastic and is cooled in the mold, as in making Micarta laminated resinoid products. In the case of glass, the material usually leaves the mold in a state bordering on incipient fusion, hence the mold finish usually exerts no effect upon the glass.

Molds usually are received from the tool department with cutting-tool, grinding wheel, and file marks showing. These marks are not objectionable in some molding processes, as in brick molding or cold molding. It is necessary to produce a somewhat finer surface on most molds, however. To do this the various curved and flat surfaces are rubbed with fine dry abrasive cloth, and thereafter with abrasive cloth wet with kerosene or light oil. On large areas buffer wheels coated with abrasive and glue can be employed. Carborundum from 180 to 320 grain is very useful for this work, and may be followed by a buffing treatment using a fairly hard wheel and a suitable cutting composition to smooth up the surface but not to polish to a bright luster.

Mirror-finished surfaces are readily produced on steels of medium hardness with buffing wheels and suitable compositions. To do this it is advisable to process as for semi-gloss and change from the emery treatment to a strong cutting composition with a hard wheel and then to use softer wheels and smoother coloring compositions until the desired finish is obtained. Wheels of correct size and contour, should be used for best results.

Special finishes, such as scratch-brushed, sand-blasted, chemical etched, embossed, engraved, or planished, have been applied to molds for producing Micarta products. Chromium has been successfully plated on steel sheets as thin as 19 gage (0.044 in.) having uniform surfaces and in sizes up to 4½ ft. x 9 ft. These sheets can be plated on both sides simultaneously and reproduced the underlying finish perfectly.

EACH different shape of mold requires individual treatment. In general, current consumption is the chief operating cost item, especially where a number of molds of the same design are being handled, and when there is a large plated area in proportion to the size of the mold, as in a plunger for glass molding. It should be remembered that only the mold faces are plated, and are used for current calculations, the remainder of the mold surfaces being insulated from the action of the plating solution by means of a protective lacquer.

When there is a production job requiring only one mold, as frequently occurs, and having an irregular shape, the cost of anodes and clamps, handling, and experimental processing, often far overbalance the current consumption. It may be necessary to plate and deplate an irregularly shaped mold experimentally several times to determine conditions for producing a uniform coating. Gross bulk of a mold forms no bar to a plating job if tanks and other plating apparatus are available.

The initial cost of chromium plating usually is high, but quickly pays for itself and earns a profit because its properties of wear resistance greatly increase the life of the mold surface, and correspondingly reduce the necessity of frequent refinishing.

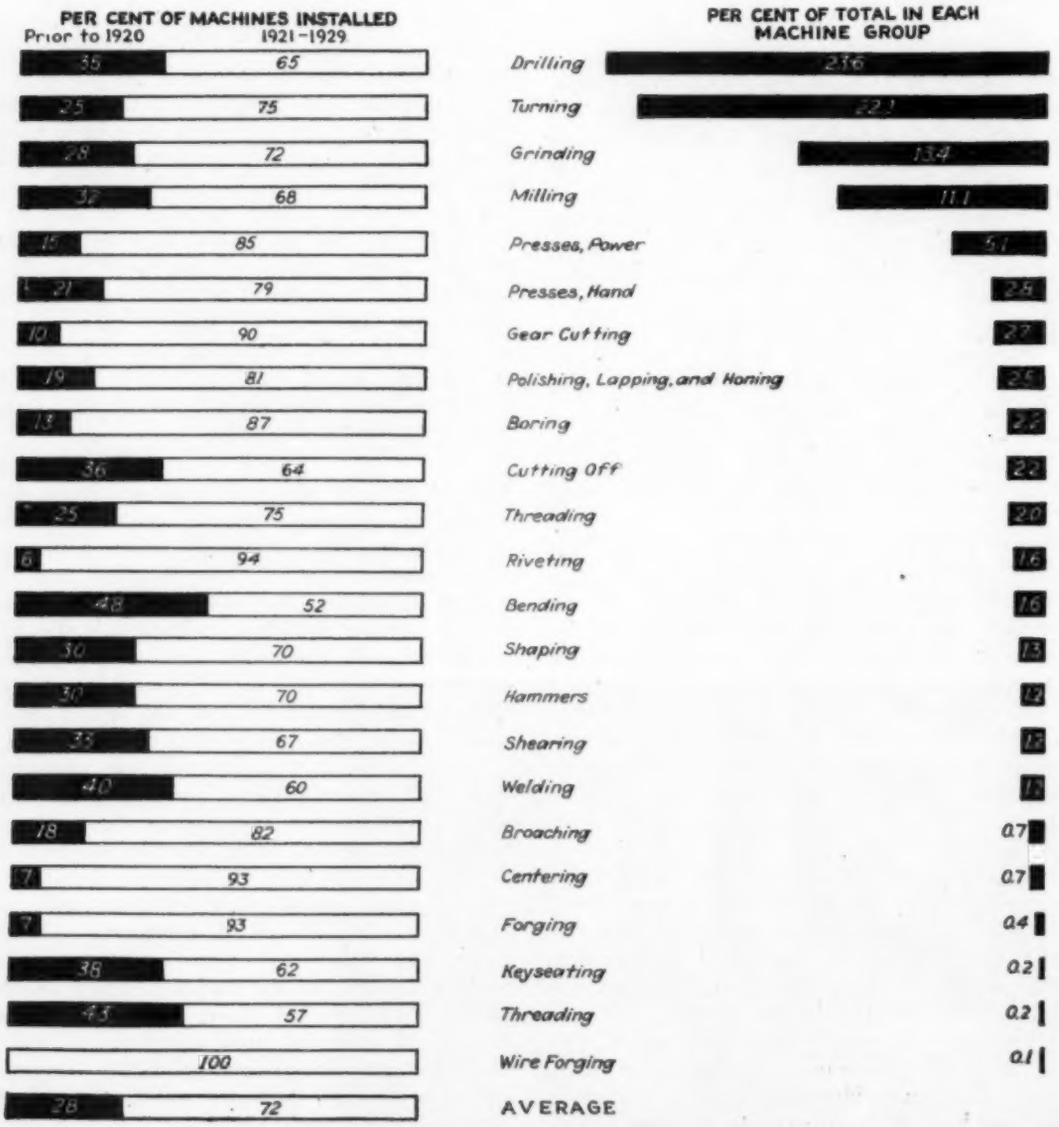
AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

THE progressive attitude of the automotive industry is again demonstrated by the comparative newness of its equipment. Under the pressure of keen competition, the manufacturing units of motor car and truck makers have met the challenge of lower prices by an alert search for new methods and machines. The result is reflected in the average percentage of equipment over ten years of age which is less than that for any industry thus far reported excepting aircraft. It is true that this figure of 28 per cent is three points higher than the ratio obtained in the American Machinist 1925 inventory. The slight difference may be laid to greater stabilization in automotive plants and practices.

Report No. 8—Machines in automotive plants manufacturing passenger cars, trucks, and trailers

This year the industry is facing a severe test. Many companies have been forced to curtail production and accept lower prices for their products. It remains to be seen whether they will have the foresight to maintain their lead in manufacturing efficiency in the face of these lean months.



Machines in Motor Vehicle Plants

	Total Number in Plants 1930	Number Installed Before 1920
LATHES		
Engine	11,267	3,467
Hand Turret	642	321
Power Turret	4,205	803
Automatic and Semi-Automatic	5,168	546
Chucking (Not Chucking Machines)	257	64
Speed and Bench	674	353
Toolroom Type	610	353
Other	738	417
CHUCKING MACHINES (Not Chucking Lathes)	257	
SCREW MACHINES		
Hand	931	610
Automatic, Single Spindle	225	64
Automatic, Multiple Spindle	2,536	
CENTERING MACHINES	867	64
MILLING MACHINES		
Hand (No Power Feed)	4,526	1,573
Bench	64	32
Plain (Knee and Column Type)	3,852	1,830
Universal (Knee and Column Type)	1,027	385
Vertical (Knee and Column Type)	1,188	482
Lincoln Type Manufacturing	417	96
Continuous, Rotary Table or Drum Type	867	64
Planer Type	385	257
Other	1,509	321
GEAR CUTTING MACHINES		
Rotary or Milling Type	1,412	32
Hobbing	1,509	128
Planing or Shaping	321	128
Other	64	32
BORING MACHINES		
Horizontal Boring, Drilling and Milling	2,375	257
Vertical Boring Mills	417	96
Other		
JIG BORERS		
DRILLING MACHINES		
Radial	3,467	1,637
Upright, One Spindle	14,060	4,045
Upright, Two or More Spindles	5,232	1,316
Upright Gang (Two or More Heads)	1,252	128
Sensitive, One Spindle	2,857	2,119
Sensitive, Two or More Spindles	899	899
Sensitive Gang (Two or More Heads)		
Two, Three and Four Way	289	
Other	1,316	
THREADING MACHINES		
Single Spindle Tapping	1,124	257
Multiple Spindle Tapping	385	128
Pipe Threading and Cutting	225	64
Bolt Threading and Cutting	353	64
Thread Chasing		
Thread Hobbing and Milling	32	32
Thread Rolling		
Other		
PLANERS		
Open Side	96	
Double-Housing	128	96
SHAPERS		
Vertical	803	
Horizontal	578	385
Slotters	225	96
KEYSEATING MACHINES	257	96
BROACHING MACHINES	899	161
GRINDING MACHINES		
Plain Cylindrical	3,050	482
Universal Cylindrical	1,412	161
Surface, Reciprocating	931	161
Surface, Rotating	2,183	738
Internal	867	417
Crankshaft	225	
Cutter	1,701	706
Floor, No Feed Attachments	3,050	1,284
Bench, No Feed Attachments	450	32
Abrasive Disk	1,509	385
Abrasive Belt	32	32
Centerless	353	
Other	867	
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	385	289
Abrasive Belt, Hand Operated	1,990	64
Automatic and Semi-Automatic	161	128
LAPPING MACHINES	353	96
HONING MACHINES	225	
CUTTING-OFF MACHINES		
Parting Tool Type	96	64
Power Hack Saw	995	449
Rotary Cold Saw	257	96
Bandsaw	738	385
Other	674	64
WIRE FORMING MACHINERY		
Spring Coiling	161	
Other		
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt	449	289
Resistance Welding, Spot	96	64
Resistance Welding, Seam		
Resistance Welding, Other		
Arc Welding	482	64
Electric Cutting		
Gas Welding	321	128
Gas Cutting	96	32
RIVETING MACHINES, STATIONARY		
Pneumatic	1,701	96
Hydraulic		
Power	321	32
PRESSES		
Punching Machines	578	32
Combined Punches and Shears	353	96
Hand, Arbor	2,472	514
Hand, Light Punch Press Work	321	225
Foot, Light Punch Press Work	706	
Power, Crank Type	963	610
Power, Toggle Type	482	
Power, Double Acting	578	128
Power, Dieing Type	449	
Power, Trimming Presses	546	
Power, Forcing, Arbor, Wheel	257	32
Hydraulic, Bending, Forming, Drawing	257	32
Hydraulic, Wheel Forcing, etc.	64	
Baling, Power and Hydraulic	770	
Other	706	
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	803	289
Bending Rolls, Horizontal	321	193
Bending Rolls, Vertical	32	32
Straightening Rolls	96	
Other	706	417
SHEARS		
Knife	931	321
Rotary, Slitting	514	161
NIBBLING MACHINES		
HAMMERS		
Drop	257	
Helve		
Spring	417	321
Steam	642	96
Pneumatic (not portable)	32	32
Other	128	
FORGING MACHINES		
Bulldozers	193	
Hot Forging Machines		
Cold Headers, Bolt, Nut, etc.		
Cold, Swaging		
Forging and Flanging Presses, Hydraulic	32	32
Other Forging Machines	225	
Total	123,749	34,599

IDEAS FROM PRACTICAL MEN

An Indexing Table for Inverted Milling Fixtures

CARL E. SCHINMAN
Production Engineer, Acro Production Company

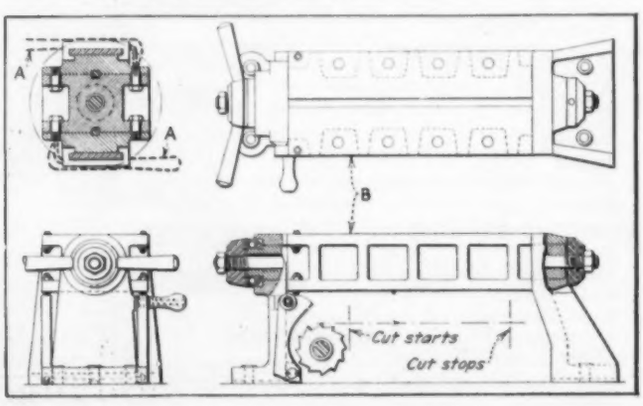
IN MILLING work of the type shown at *A* on manufacturing millers, where the cutter is above the work, much trouble is experienced from chips lodging in the fixtures. Also, machining time is lost while the fixtures are being loaded. The indexing table shown in the illustration was designed to obviate these troubles.

The table *B* has trunnions at the ends and is supported by two uprights mounted on the table of the machine. Pairs of fixtures for holding the work are mounted on both the top and bottom surfaces of the table, the cutter operating on work in the fixtures on the bottom. By this means, the fixture on the top can be loaded or unloaded without interfering with the progress of the cut. After the cut has been completed and the table has been returned to the starting position, the table is indexed 180 deg., bringing the finished work uppermost and the work to be milled, underneath.

After the table has been rotated, two index fingers, one on each side, are swung into place, their tops contacting with adjustable stops in the table. By this means, the part of the table that is below can always be brought into parallelism with the machine table, even if both sides of the indexing table are not parallel. Also, if a slight taper is required on the work in a direction crosswise of the table, it can be arranged for by a proper adjustment of the stops. Both indexing fingers are mounted on a rod passing through their lower ends, so that they move together in unison. Their motion in either direction is limited by toes at their bottoms striking the machine table. The index fingers are moved by a handle, inside of which there is a spring-actuated index pin, its inner end engaging in a dimple to prevent the fingers from being disturbed by vibration.

Running lengthwise through the table is a tie rod, threaded on both ends. While the tie rod is a slip fit in the table and can slide endwise, it is prevented from rotating by a feather key. At the left-hand end is a collar nut provided with handles, also, an ordinary nut beyond it, spaced two or three threads away. In indexing the table, the collar nut is revolved by the handles in a counter-clockwise direction, bringing it against the nut beyond, arresting its movement on the tie rod and transferring the motion to the table. Thus, the tie rod, and through it the table, is revolved. After the index fingers have been swung into place, the collar nut is revolved in a clockwise direction, bringing it against the supporting upright, springing the upright slightly, so that the shoulders on the table trunnions are held tightly against the inner ends of the bearings of both uprights. A ball thrust-bearing under the collar nut relieves the friction between the nut and the end of the bearing on the upright, permitting the nut to be tightened with less effort.

The collar nut at the right-hand end is for adjusting the tie rod lengthwise, so that the collar nut on the opposite end will be stopped when its handles are in such position as not to interfere with loading or unloading the fixtures on top of the table. When the table is in position for starting the cut, it can be indexed without interfering with the cutter.



Milling Ports in a Valve Bushing and Cutting Steam Ports in Cylinder Bushings—*Discussion*

F. M. A'HEARN

Lest Max Schwarze and W. H. Westbrook, after reading J. T. Towlson's article under the title given above, on page 63, Vol. 73, of the *American Machinist*, should feel that their articles on page 273, Vol. 72, may not be properly appreciated by other readers, I wish to commend and thank both gentlemen for the information contained in their respective articles.

That at least one of the writers, Mr. Westbrook, is familiar with the method mentioned by Mr. Towlson, is evident as shown in the first paragraph of Mr. Westbrook's article, where he mentions that the regular practice is to mount the bushings on the revolving table of the milling machine, but that in the case mentioned the milling machine was not available. Whether Mr. Towlson did or did not read this paragraph before suggesting that the gentlemen investigate the possibilities of revolving table is immaterial. The outstanding feature of both articles is that both of the authors are conveying to other readers a means other than the conventional way of doing the job.

There are but few progressive readers of the *American Machinist* who do not know that special attachments are provided by machine tool builders for all standard tools, and also that tool builders will design and build special machines whenever the demand justi-

fies the added engineering and manufacturing costs.

In my opinion, the value of the department "Ideas From Practical Men" is that the articles reflect to a greater degree the resourcefulness and creative ability of the writers, than does a mere description of operations that are every-day knowledge to practical workmen. I thoroughly enjoy articles by such able writers as Messrs. Schwarze, Westbrook, and Kiddle, and trust that I may often have the benefit of their progressive ideas.

Just as true as the statement that "Good bread was made before cook books were published," is the thought that we all may learn from the mechanic who is able to turn out intricate and difficult jobs with makeshift tools.

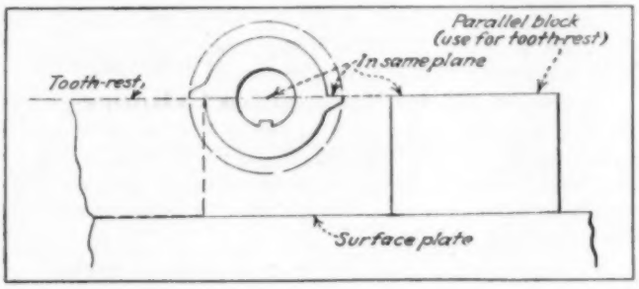
■

Device for Testing the Grinding of Hobs
Discussion

GEORGE BELBES
Production Engineer, Gaertner Scientific Corporation

In an article under the title given above, on page 629, Vol. 72, of the *American Machinist*, E. E. Keeler describes a method of ascertaining whether or not the faces of the teeth of hobs have been ground radially. While the method is a simple one, it will give rough determinations only.

In our shops, such problems are solved in the following manner: The hob is mounted on a mandrel supported on bench centers, and the whole assembly is



placed on a surface plate. With a height gage equipped with an indicator, one tooth of the hob is aligned with the center of the mandrel. An adjustable parallel is set so that its upper surface is in the same plane as that of the tooth and the center of the mandrel. The adjustable parallel is then brought to the other side of the hob and the face of one tooth is rested fully upon it. The surface of the opposite tooth is again indicated. Any difference between the first and second indications of this tooth will be a measurement of the grinding error. The illustration shows the scheme. If necessary, all the teeth can be tested in the same manner. While this method requires time and care, the desirability of obtaining accurate gear teeth makes the effort worth while.

Grinding Fixtures for Airplane Engine Work

FRANK A. STANLEY
Consulting Mechanical Engineer

A grinding fixture for finishing the holes in the link rods of the Kinner airplane engine is shown in detail in Fig. 1. In principle this fixture is a modified grinder faceplate designed to center the link connecting rod accurately from the piston pin hole after which the central locating plug is removed and the hole ground to size and to correct center distance.

The work is shown set over a locating plug *A* at the center of the internal grinding fixture while a second plug is shown in position at the outer end of the connecting rod. Both rod holes are a few thousandths under size, allowing for finishing by an internal wheel. The outer end of the rod is carried over a split bushing on a taper plug. The diameter of this bushing is about 0.010 in. under finish size, and just fills the hole bored in the rod end. Tightening of the screw in the plug clamps the rod internally at that end. The inner end of the rod over the center of the fixture *A* is located by an expanding plug with two centralizing jaws so that when a knurled head screw is adjusted the work is gripped from the bore of the hole. This locates the rod

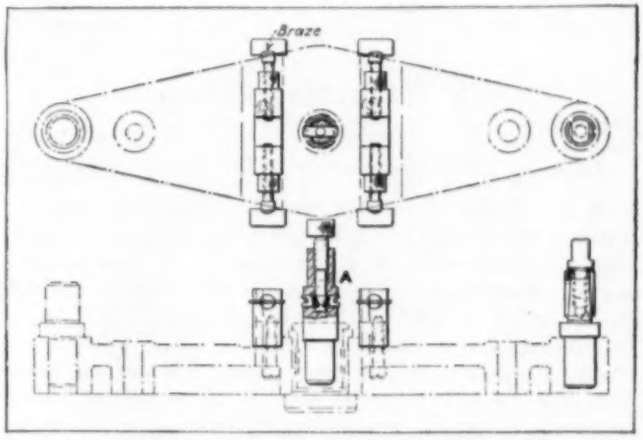


Fig. 1—Fixture for locating and grinding holes in link connecting rods

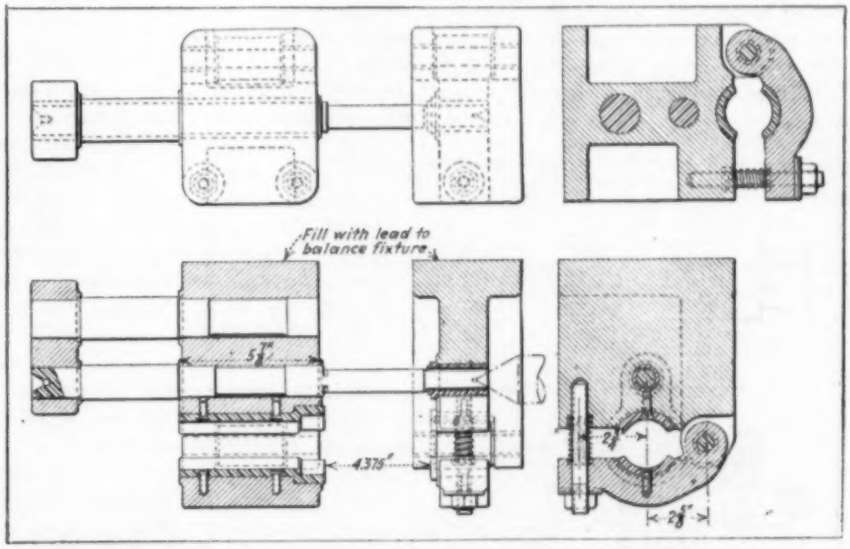


Fig. 2—Counterbalanced fixture for grinding crankpin on its own centers

correctly for grinding the first hole upon removal of the locating plug at that end.

Then the split bushing and plug at the outer end are removed and replaced with a plug filling the hole just finished in the other end of the rod. This enables the work to be reset over the plugs with the exact center distance obtained for the grinding of the second hole and with assurance that the rod is held correctly in respect to alignment of the first hole ground. The plug now set at the center of the faceplate brings the unground hole into central position for finishing as soon as the locating plug is removed. With the rod placed in position as indicated it is secured lightly but firmly by means of light thumb screws at the side. These merely hold against side displacement during the grinding.

A fixture for grinding crankpins is shown in Fig. 2. The body of the crankshaft is located in the hinged jaws, and the hinged members are drawn up by nuts and washers on studs with compression springs acting between the body of the fixture and the caps. The main arbor which passes through the crankpin hole and carries the cast iron body members of the fixture is of nickel steel and is provided with liberal centers that are accurately lapped to insure proper mounting between the grinding centers. This fixture not only grinds the pin on its own central axis but also balances the weight so as to prevent vibration during the grinding operation.

■

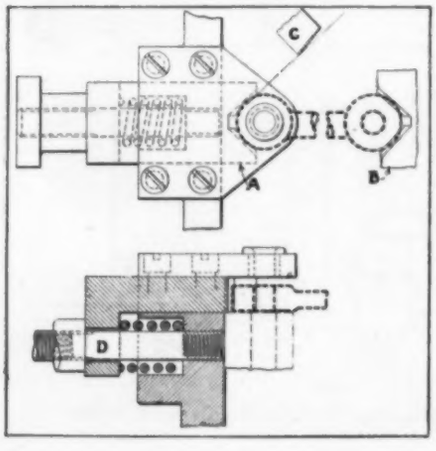
A V Locating Clamp

JOHN G. JERGENS
Engineering Department, the Warner & Swasey Company

A V locating clamp that can be adapted to jigs and fixtures for certain kinds of work is shown in the illustration. The work shown in the jig is a small connecting link, indicated by heavy dotted lines. The end to be drilled is held in the V-block *A*, which slides in an opening under the bushing plate. The opposite end of the work is held in the stationary V-block *B*. Both V-blocks, besides being planed to the usual angles for centering the work, are undercut at an angle, as shown at *C* to force the work down upon the seats.

The stud *D* is threaded on both ends, the inner end being a tight fit in the tapped hole in the jig body. On the other end is a knob, which when turned to the right, forces the sliding V-block against the work.

When the knob is turned in the opposite direction, the spring causes the sliding V-block to move to the left, freeing it from the work. As will be seen in the illustration, the sliding V-block has an apron at *D*, in which there is a clearance hole to permit the stud to pass through. The apron acts as an abutment for the shank of the spring.



SEEN AND HEARD

●

Oil Pipes and Alibis

A BROKEN oil pipe is the favorite alibi of nearly every aviator who fails to break a record for altitude or otherwise. If oil pipes really break as often as claimed it is time for designers and inventors either to produce pipes that will not break or eliminate the pipes altogether by drilling oil passages through the engine castings themselves. Most airplane engines vibrate considerably, and propellers also cause vibration—the probable cause of oil pipe failures. Whatever the cause, it is time either to reduce vibration or make oil-carrying passages proof against such frequent breakage.

Over Enthusiastic Friends

WITH VERY FEW exceptions a new device or tool is injured more by its over-enthusiastic friends than by its opponents. Nothing gives a new tool or new idea a black eye so quickly as having it fall down on the job. And in many cases it falls down simply because it is used on a job that is out of its field.

The new tungsten-carbide tools are no exception. In too many cases they have been put on the wrong job or used in the wrong way. Those who are successful do not always try to see how fast the tools can be run. Some maintain the same speed but get a much longer life between grinds. Others multiply speed and output for the same tool life, while, in many cases, a combination of both works out to the best advantage.

If users of any machine or tool will keep an eagle eye on the net results, instead of being led to extremes of either speed or long life, the stockholders will get fatter dividends. Don't be over-enthusiastic nor yet too lukewarm and pessimistic. There's usually a happy medium that gets best results.

Turret Drill Presses

TIMES CHANGE—and in most ways the "good old days" exist only in the imagination. We forget the bad and remember only the pleasant features of the long ago. Few, today, remember the old turret drill press built by A. D. Quint of Hartford, very useful in giving the operator six spindles for drills or reamers. This machine obviated the necessity of drifting the drill out of the spindle and replacing it with others on every piece as six tools were carried in the vertical turret, each spindle being driven by a cone friction.

Gang drills, with enough spindles to carry all the tools needed were preferred to the turret idea and it passed out of the picture about 30 years ago. Then, too, the advent of the quick-change drill chuck, or socket, that enables an operator to change tools without stopping the spindle, is more simple than any turret arrangement yet devised. And although we may not think drilling practice has changed as much as some other operations, a look backwards shows that a great advance has been made.

—*J. R. G.*

Marketing Analysis—I

WITH the onrush of competition, marketing becomes more and more intertangled with production. Unless products bring profits, why produce them? Marketing analysis becomes an indispensable tool, albeit a mysterious tool to many.

The New England Council has eliminated much of the mystery through six groups of searching questions under the following groupings: Our Product, Our Customer, Our Tools, Our Sales Plan, Our Costs, Our Results. These have been distributed to Council members, and *American Machinist* has been granted permission to publish them in full. The first three groupings appear herewith, the final three to follow in another issue.

1. OUR PRODUCTS

No.	Questions	Answers
1	How do we know our product fully meets the customer's needs, tastes, or ideas?	
2	Have we recently checked with our customers whether or not our product is satisfactory to them?	
3	Is quality of our product the best possible for the purpose or service for which it is designed?	
4	Can we increase the utility of our product? Should we re-design?	
5	Can we develop new uses for our product?	
6	Can we improve the appearance of our product?	
7	What other improvements if any would be acceptable to our customers?	
8	Does our product meet nationally recognized standards and specifications for goods of its class or kind?	
9	Are products of some other industry displacing our products?	
10	Are there products for which buyers are waiting that we should be developing?	

2. OUR CUSTOMER

11	Who buys our product and why?	
12	How often does each customer buy our product?	
13	How much of our product can each customer use to advantage?	
14	What per cent of our annual sales are repeat orders? Are we reducing our customer turnover?	
15	Are we inviting customers who have not bought recently to consider the advantages in our latest product?	
16	Who are prospects for our line?	
17	Where are they located?	
18	How many of them are there?	
19	What per cent of *total* market for our class of product is represented in our sales? Can we increase this?	
20	Are we using the Department of Commerce "Market Data Handbook," "Industrial Structure of New England," "Commercial Structure of New England," as market information sources? Why not?	
21	What allied or related lines are customers buying? Why?	
22	What competing lines are customers buying? Why?	
23	Do such purchases suggest new markets,—new selling activities,—we should develop?	

3. OUR TOOLS

No.	Questions	Answers
24	How can we improve our training of salesmen?	
25	Have we furnished our salesmen a manual of selling ideas and complete information about our product, its use; our company and its policies?	
26	What difficulties do our salesmen have in selling our product? Do we record, analyze, and correct these difficulties?	
27	Do our salesmen obtain orders without concessions?	
28	Do our methods of compensating salesmen produce the incentive necessary for the desired results?	
29	Do our studies of dealers' methods of selling and displaying our product suggest new ways of helping them sell more and make more?	
30	Can we increase sales through a more liberal credit policy *without* exceeding the percentage of bad-debt loss allowable for our business?	
31	Do our methods of packing, shipping, and delivering bring our products to the customer in the best condition, in the least time, and at the lowest cost?	
32	How much can we increase our service to customers without sacrificing too much profit?	
33	Is anyone in our field giving lower price, better value, and better service?	
34	Does our advertising tell the customer what our product will *do* for him or does it merely describe it?	
35	Are we doing enough consistent advertising to prove its sales value?	
36	Do we apply what we learn by comparing competitors' advertising with ours?	

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Ford's Visualization of Welding

". . . . . with electric welding we strike out into a new field. . . . . The ability to combine parts by welding means the introduction of a whole new technique in metal manufacturing. We have just started . . . . . The casting and the rivet are doomed. —HENRY FORD.

PERHAPS Mr. Ford's utterance is not to be taken too literally, but it cannot be denied that every production man should be keeping track of the extremely rapid and important advances which have been made in welding on a production scale, especially in the Ford and other automotive plants.

Castings still are used extensively in Ford products and perhaps always will be. At least one Ford part, made for a time from stampings welded together, is now being produced as a casting, but a reversion to the welded construction in this case may yet occur, and many other parts, formerly cast, now are fabricated by welding.

Production executives will do well to read the two articles on Ford welding, the first of which appears in this issue, as well as other articles on welding scheduled for later issues.

Parable

ONCE, not so many years ago, there strode to his luncheon club a Progressive Machine-Shop Executive. Meeting his friends there, he orated: "The only way to bring Better Business is to modernize, to plan for the future, and to Help Business. We must all do our part; we must all put our shoulders to the Wheel!" Thereafter, much pleased with himself, he departed for his own office.

There awaited him his Master Mechanic. Said the M.M.: "Sir, our toolroom lathes are all over 20 years old. They are falling to pieces. I am afraid we cannot run them much longer."

"Fix them up," cried the executive. "We cannot afford to replace them now. We must wait for Better Business!"

Out walked the M.M. In walked a Prospective Purchaser. Said the executive: "You must prepare for Better Business! Who can Help Business if we do not? You need new equipment; I can supply it. Get the 1930 point of view! Modernize! Put your shoulder to the Wheel!"

So saying, he puffed proudly at his cigar and put his feet on his desk. Said the Prospective Purchaser: "Let us, instead of talking, play golf."

"Okay," said the executive, reaching for his golf bag. "You know, this is an old bag, but I cannot afford a new one until we get Better Business. It is our job to make it come. We must all do our part; all must put our Shoulders to the Wheel." And so saying, he slung his old golf bag over His shoulder and departed with his friend.

Sacred Cows

ANY shop manager who is sheltering a herd of sacred cows in the form of venerable machines that should be scrapped or donated to a museum, owes it to his stockholders and to his employees to do a little house cleaning. If he really has an affection for the ancient units why not shine them up, put them in the lobby, and placard them with a history of their accomplishments. Such action might attract the interest of customers. At least, it would get the sacred cows out of the path of progress.

While these observations apply to any kind of plant they are doubly important to the builder of manufacturing equipment. He is by nature something of an artist, a sentimentalist, a man who has visions which sometimes take tangible form. He is, therefore, peculiarly susceptibe to the sacred cow complex. And, in his case, it is peculiarly dangerous because he preaches the advantages of replacement of obsolete equipment. His customers are quick to notice any failure to practise his own preachments. He cannot afford sacred cows.

Not a Gamble

WITH prices of many raw materials down below production costs, some of the larger manufacturers are buying heavily. Smaller manufacturers should not allow themselves to be caught and squeezed in a possible sellers' market.

SHOP EQUIPMENT NEWS

Heald No. 77 Heavy-Duty Internal Grinder

WITH the offering of the No. 77 heavy-duty internal grinder, the Heald Machine Company, Worcester, Mass., has entered an entirely new field with regard to size of internal grinding equipment. The No. 77 weighs a little over 9 tons and is about twice the size of any previous machine. It has been designed to do large work and to have unusual power. Specifications state that the largest bore that can be ground using a 12-in. wheel is 21 in., and the smallest bore, 3 in. The greatest length of bore is 15 in., and the swing over the table is 35 in. in diameter. These specifications, together with a total of 31 applied horsepower, illustrate the capacity and size of this internal grinder.

The No. 77 machine is designed primarily for the rapid removal of large amounts of stock with fine finish and close accuracy on big work. It constitutes a means of rapidly hogging out metal from large gears, bearing races, rolls, pipes, sheaves, and other parts, and then finishing the piece to close limits. It will grind straight or taper bores with equal facility and face grind without changing the set-up.

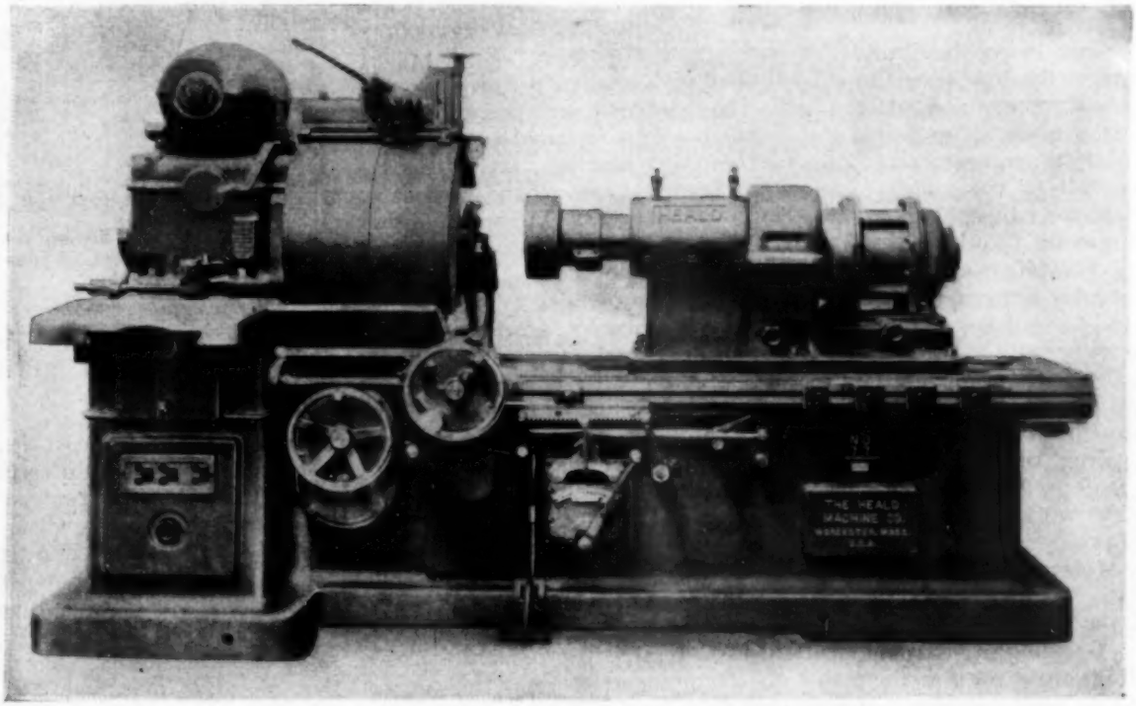
Compact, self-contained, unit design has been employed. The weight of 9 tons and the low center of gravity fit the machine for rough, heavy work, as well as affording vibrationless operation for finish grinding to close limits. In addition, the close-to-the-floor design facilitates handling the work.

Three motors totaling 31 hp. provide the drive, one for the wheelhead, one for rotating the work, and one for driving the pump of the hydraulic system. The use of three motors affords direct, efficient drives to these units. Use of anti-friction bearings throughout assures a minimum power loss, and only one belt is used; that being a 7-in. endless belt for the wheelhead to assure vibrationless transmission of power to the spindle. Pressure feed of lubricant to all the sliding ways is another feature.

Hydraulic table operation gives speeds varying from 0 to 25 ft. per minute. Since the sliding table plus the wheelhead and driving motor have a weight of 3,300 lb., reversal at the maximum table speed is accomplished without vibration. All controls are concentrated at the front, where the operator can govern the starting and braking of the workhead, the feeding

Specifications

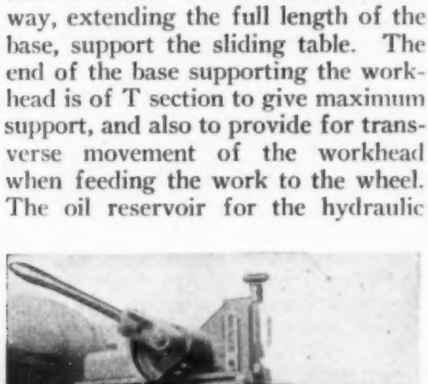
Largest bore, in.	21
Smallest bore, in.	3
Greatest length of bore, in.	15
Swing over table, in. in diameter	35
Swing inside standard water guard in. in diameter	21
Center of workhead spindle from floor, in.	47
Hole through spindle, in.	1⅞
Workhead speeds, r.p.m.	35 to 140
Table speeds, ft. per min.	0 and 25
Total transverse movement of workhead, in.	14
Maximum swivel of workhead, deg.	22½
Diameter of work spindle flange, in.	12
Maximum travel of table, in.	36
Length and width of base on floor, in.	116 x 46½
Floor space, in.	123 x 78
Net weight, lb.	18,000
Total hp.	31



Front view of Heald No. 77 Internal Grinder, which weighs 9 tons and will grind bores to 21 in. diameter by 15 in. in depth

and reversal of the table, the cross feed, the dial indicator, the diamond, and the motor control panel, without moving from his position.

The base is a 4-ton, one-piece, box-type casting, having a 20 per cent steel content. One V- and one flat-way, extending the full length of the base, support the sliding table. The end of the base supporting the workhead is of T section to give maximum support, and also to provide for transverse movement of the workhead when feeding the work to the wheel. The oil reservoir for the hydraulic



Sizing device employed on the Heald No. 77 Internal Grinder, which has a diamond-pointed finger in contact with the hole at all times during grinding

system is cast in the base, and the cupped rim of the base serves to collect coolant drippings and oil.

The main table drive is by the Heald hydraulic arrangement. Automatic reversal of the table is controlled by three adjustable dogs, two of which are set for the reversal of the table, providing any length of movement up to a maximum of 36 in. The third dog allows the table to withdraw sufficiently so that the wheel can pass the diamond during the truing operation. A hand lever and a treadle, working in conjunction with this dog, permit the table to withdraw when it is desired to true the wheel, measure the work, or have the table go to rest position. Hand reversal of the table at any point in the travel is obtained by moving a ball handled lever in the direction movement is desired. Grinding speeds obtained by the throttle control give the operator any rate from 0 to 25 ft. per min.

Hand longitudinal feed is provided by a rack meshing with a pinion, and operated by a handwheel located at the front of the machine. A lever at the right of the handwheel controls a valve which bypasses the oil, temporarily discontinuing the hydraulic functions of the table and allowing manual advance and return of the same for face grinding, as well as aiding in setting up the machine.

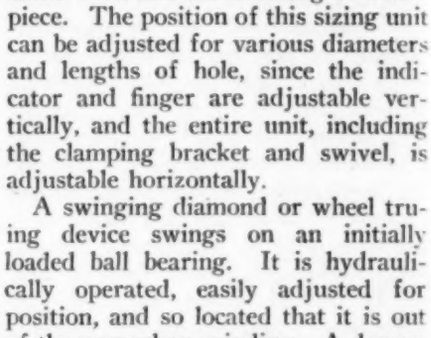
The wheelhead and driving motor form a single unit. The spindle is mounted in two anti-friction bearings carried in a cradle, which is cast integral with the spindle bracket. A heavy cast-iron cap bolted to the cradle holds the spindle securely in position. Lubrication is by sight-feed oilers. The 25-hp. motor is adjustable transversely to compensate for belt stretch. An adjustable spring idler, running on anti-friction bearings, maintains correct tension in the belt.

The workhead is mounted on a cross-slide at the T end of the machine, and is securely clamped by six bolts sliding in a full circular T-slot, which is machined in the bearing surface on the cross-slide. The head can be swiveled on a large stud by means of a precision device, consisting of a crank-operated screw, one end of which is located in a bracket attached to the cross-slide, while the opposite end is held in a stud swiveling in a bracket cast on the base of the workhead. Adjustment to 22½ deg. is provided, with the amount of swivel indicated by a graduated scale.

The hardened and ground workhead spindle is mounted on two large anti-friction bearings, and is driven by a hardened and ground worm and bronze worm gear. The spindle bearings are readily adjusted from the front of the workhead. Drive to the worm and wormshaft is provided by a silent chain and sprockets from a 3-hp., adjustable-speed, d.c. motor through a double-disk clutch. The clutch provides one position for driving, one position for braking, and a neutral position that allows the fixture to be revolved by hand when setting up or loading. Spindle speeds varying from 35 to 140 r.p.m. are available. The flange of the spindle is 12 in. in diameter to assure substantial anchorage for the work fixtures. A large work guard incloses the fixture and confines the coolant and abrasive dust to the limits of the machine.

One of the features of the No. 77 machine is a dial indicator that enables the operator to follow constantly a change of size by direct readings. The indicator not only tells him when the hole is finished, but enables him to true the wheel at any predetermined point before the finish size is reached. The sizing control unit has a diamond pointed finger in contact with the bore of the work at all times when grinding, but it can be swung out of the way by a hand lever to allow for the removal of the finished work and the chucking of a new piece. The position of this sizing unit can be adjusted for various diameters and lengths of hole, since the indicator and finger are adjustable vertically, and the entire unit, including the clamping bracket and swivel, is adjustable horizontally.

A swinging diamond or wheel truing device swings on an initially loaded ball bearing. It is hydraulically operated, easily adjusted for position, and so located that it is out of the way when grinding. A dog on the table is provided as a safety meas-



Hydraulic wheel truing device at rear of Heald No. 77 Internal Grinder

ure to trip the valve automatically and return the diamond to rest position, if the operator fails to take care of it manually.

The feeding principle of the No. 77 machine is entirely different from other Heald internal grinders, in that the work is fed to the wheel instead of the wheel being fed into the work. This is accomplished by mounting the workhead on a cross-slide carriage on dovetailed ways. A tapered gib assures correct transverse alignment of the slide at all times, while a flat gib on the under side of the slide serves as a further guide and also prevents lifting of the slide when heavy work

is being ground at very coarse feeds. These ways are oiled by a pressure feed system.

Movement of the cross-slide is obtained by means of a fixed nut on the under side of the slide, this nut meshing with a large diameter screw equipped with ball thrust bearings. The screw is rotated through bevel and spiral gears and a connecting shaft from a ratchet and pawl feeding device at the front of the machine. Any amount of feed from 0.00014 in. to 0.0011 in. per stroke of the table is obtained by an adjustable pawl engaging the teeth of a circular ratchet on the cross feed unit. Movement of the pawl is obtained from reciprocation of the table through a pivoted bracket, one end of which carries the pawl and the other end a roller. As the table reciprocates, an adjustable table dog elevates and lowers the roller, imparting motion to the pawl through the pivoted bracket. The dog can be positioned to feed at either end of the stroke. By using a second dog, feeding at both ends of the stroke can be obtained, whereas on extremely long work, from which large amounts of metal are being removed, a third dog can be used to feed at the middle of the stroke to compensate for wheel wear. As on other Heald internal grinders, the feed can be controlled by hand, if desired.

A coarse feed for the wheel can be set for rough grinding up to a predetermined limit of the finished size of the hole, at which point the roughing feed automatically changes to a finishing feed. A cam throws off the automatic fine or finishing feed, when the work has reached the finish size. To keep the relation of this cam to the required size of the hole and to compensate for wheel wear, a knob on the handwheel advances the cross-slide without altering the set-up. If the operator is cross feeding by hand, there is also a positive stop that facilitates accurate sizing of duplicate parts.

Anti-friction bearings are used on all revolving members, such as the workhead, wheelhead, oil pump, cross-feed screw, and wheel-truing device. Coolant is delivered at the grinding point in large volume from a 125-gal. tank. The coolant flows only while the grinding wheel is in the hole. A valve on the back of the machine, controlled by adjustable cams at the rear of the table, starts and stops the coolant as the wheel enters and leaves the hole.

The machine is self-contained and available only in one motor-driven model, with a 3-hp., adjustable-speed motor for the workhead, a 25-hp., constant-speed motor for the wheelhead, and a 3-hp., constant-speed motor for the rear shaft. If a coolant system is ordered, an individual 3-hp. motor drives the pump.

All electrical control equipment is contained within the floor space limits of the machine. The central switch panel and workhead motor rheostat are located in a recess in the T-end of the base, where they are out of the way and yet convenient to the operator.

Fig. 1—Trent No. 400 Indicating Temperature Control Gage with a range of 100 to 500 deg. F.

Fig. 2—Trent Type NI-5 Non-Indicating Controller, which can be supplied with a control pointer set to any position for a given value

Trent Automatic Temperature Control Gages

Four automatic temperature control gages have been placed on the market by the Harold E. Trent Company, 439-43 No. Twelfth St., Philadelphia, Pa. Of the four gages marketed, two are indicating controlling instruments covering the range from 100 to 1,000 deg. F. The type 400 illustrated in Fig. 1 is for temperatures from 100 to 500 deg. F., and operates within 2.5 deg. plus or minus of where the adjustable pointer arm is set on the scale. The type 800 holds the temperature to within 5 deg., one scale division, over the range 200 to 1,000 deg. F.

The types NI-5 and NI-10, the form being illustrated in Fig. 2, are non-indicating controllers with 20 arbitrary divisions on the front plate, an index, and a pointer. The mechanism otherwise closely follows the Types 400 and 800 controls, except for the absence of the calibrated scale. They can, however, be supplied with the control pointer set to any position for a given value. The actuating mechanism consists of a steel bulb, capillary tube, and a steel bourdon spring of many turns, the whole of which is filled with mercury. This bourdon tube mechanism actuates a moving arm contact, which cooperates with two other contacts, one high and the other low, so that when used with a suitable relay, the temperature range may be maintained within plus or minus 5 deg. of the value set.

Protecting tubes for the control bulbs, of which an example is shown in Fig. 3, are made in three standard lengths, either of copper, steel, or Monel metal, to suit individual requirements. The tube itself is integral with a ¾-in. pipe thread.

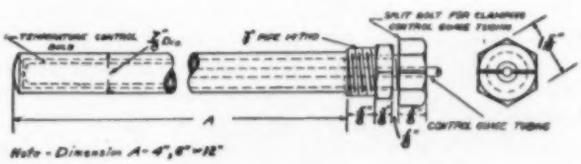

TEMPERATURE CONTROL BULB
¾" PIPE WITH
SPLIT BOLT FOR CLAMPING CONTROL BULB TUBING
A
CONTROL BULB TUBING
Note - Dimension A - 4", 6" or 12"

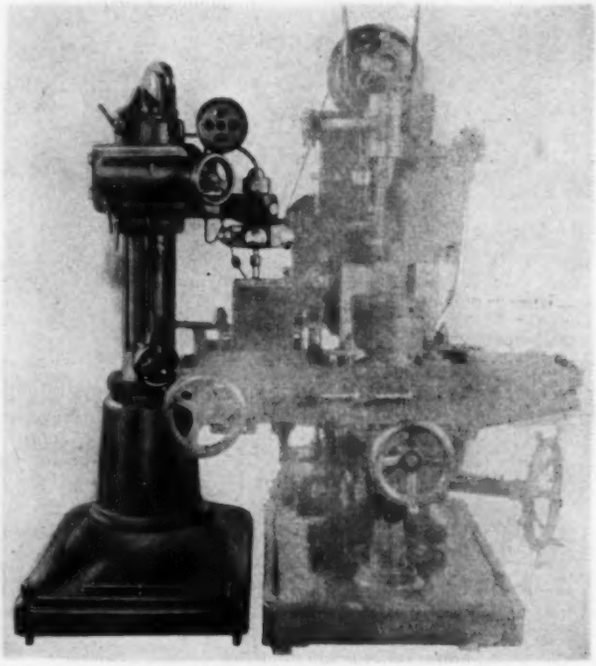
Fig. 3—Protecting tube for control bulbs used with Trent temperature control gages. Either copper, steel or Monel metal may be employed for these tubes

Walcott Transcribing Instrument for Die Sinking

A simply constructed transcribing instrument for use in all kinds of profiling work is now being manufactured by the Walcott Machine Company, Jackson, Mich. This apparatus is designed for use with any vertical milling machine, and converts the latter into a speedy, die sinking machine. It is claimed by the manufacturer that inexperienced operators can make all kinds of dies and metal molds by means of this instrument in less than half the time formerly required by skilled die makers.

This machine has been developed to eliminate the laborious "cut-and-try" method. Therefore, the instrument which has been made to sell at a nominal price, is accurate in the work done. In making dies or metal molds by this method, the procedure is simple. After rolling the transcribing instrument over to the milling machine to be used, the plaster mold of the form to be cut in the die block is placed on the table of the milling machine at the left side of the spindle. The plaster mold is then lined up as to position with the position of the die block by means of pointers inserted in the transcribing instrument and in the head of the milling machine. After the work is thus centered, a cutting tool is inserted in the head of the milling machine and a "follow-button," corresponding to the form of cutting tool used, is inserted in the head of the instrument. The table of the milling machine is then adjusted so that the cutting tool is about 0.004 in. above the face of the die block. The arm of the instrument is then lowered so that the "follow-button" just touches the top face of the mold.

The operator is now ready to transcribe the form of the mold in the face of the die block. He feeds the table of the milling machine so that the transcriber "follow-button" comes in contact with the pattern. This causes the rotating cutter of the milling machine to cut the same shape into the die block. The accuracy of the operation is sensitively controlled by means of a visible station, which signals to the operator the direction or directions in which to feed the table in order to duplicate or transcribe from the pattern to the work. For example, when the operator has gone deep enough, the center signal light goes out; when he has gone far enough to the right, the right-hand light goes out, and so forth. This signal system entirely eliminates the necessity for taking measurements. Depth gages, radius gages, and other items are not required to produce accurate workmanship. One plaster mold is said to be satisfactory as a guide in making as many as 45 to 50 dies. Where larger quantities are required, however, it is recommended that the first die be used as a guide in making the others.



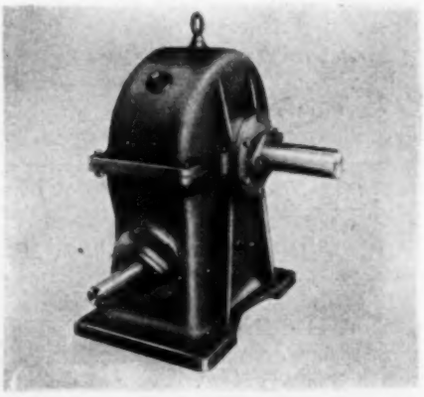
Walcott Transcribing Instrument placed beside a vertical milling machine for die-sinking operations. Direction for feeding the milling machine table is indicated by a visible station

The Walcott transcribing instrument can also be adapted for use on milling machines having heads that move vertically. On such installations the base is discarded and the instrument is mounted in the vertical head. Where used in connection with a knee-type milling machine, the instrument can be rolled from one machine to another, inasmuch as it is mounted on ball bearing casters, which can be utilized simply by releasing the corner leveling screws. Another feature of the device is that the transcribing instrument does not interfere in any way with the regular operation of the milling machine. It is only necessary to release the column lock and swing the instrument arm out of the way. Among other features, the instrument operates directly from any regular light socket, either a.c. or d.c.

Specifications are as follows: Center of instrument to center of column, 14 in. minimum, 38½ in. maximum; bottom of instrument chuck to floor, 32½ in. minimum, 61 in. maximum; floor space required, 32x43 in., and net weight, 2,500 lb.

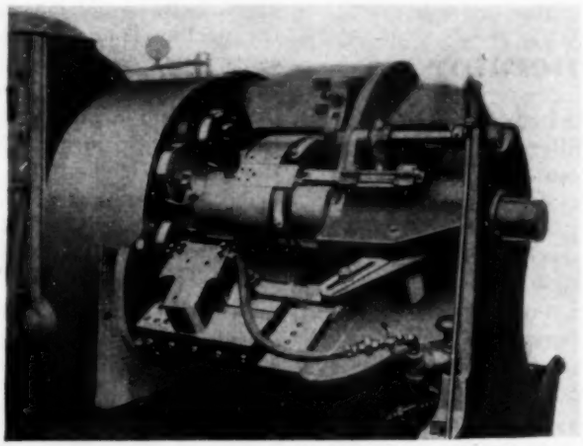
Boston Type TF Right-Angle-Drive Speed Reducer

Heavy-duty speed reducers for right-angle drives are now available from the Boston Gear Works Sales Company, North Quincy, Mass. These reducers, designated as the



Boston Type TF Right-Angle-Drive Speed Reducer available in sizes up to 20 hp.

type TF, are available from stock in sizes up to 20 hp. and in ratios from 15½ to 1 up to 80 to 1. The construction is similar to the other "T" types, consisting of a phosphor-bronze gear operating with a hardened and ground steel worm. Shafts are mounted on Timken bearings.



Baird Horizontal 7 x 8-Inch Six-Spindle Lathe

Work up to 7 in. in diameter by 8 in. long can be turned on the six-spindle lathe developed by The Baird Machine Company, Bridgeport, Conn. The illustration shows the work end of this machine, the rest being similar to the horizontal, six-spindle chucking machine built by the company. The lathe, however, is designed to handle work turned on centers, the center bar of the machine carrying a turret containing the tail centers, this bar and turret indexing with the spindle turret. Longitudinal adjustment of the tail center turret is provided to suit the length of the work.

An automatic take-up eliminates looseness or slack on centers, which develops in doing work of this nature. At each station, the slides which carry the centers are unlocked, the looseness taken up, and the slides again locked, all being done automatically.

Ease and speed in unloading and reloading work are obtained by providing a treadle for withdrawing the tail centers, thus leaving both the operator's hands free to handle the work. When the machine is arranged for "double indexing," two pieces of work are unloaded and loaded and the turrets index two stations at each cycle of operations. With this feature, as soon as the operator raises his foot from the treadle, one center advances before the other, so that the operator can locate first one piece of work on its center and then the other. This permits him to perform the operation more quickly than if he had to line up two pieces on their respective centers at the same time.

Another feature is the automatic safety control and machine stop, which is of particular value where the operator is attending more than one machine. When the treadle is depressed in the ordinary process of unloading and loading, the turrets cannot index. Thus possible damage and loss of time are avoided, should the operator be late in getting the machine reloaded. The machine stops automatically when the cycle of operations is completed. But, however, the machine is reset automatically to proceed with its work by the actions of the operator in the ordinary process of unloading and reloading, no other action or motion being required.

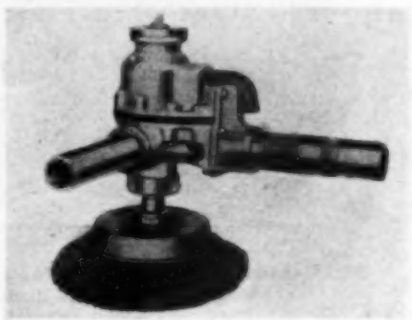
Ordinarily, four longitudinal slides are provided, which are carried on the head and tail stocks of the machine and receive their motion from the cam drum in the head. Through adjustable link connections, each slide may be given the same or a different stroke. All tools are easy to get at for resetting and adjustment as needed.

When the machine is set up as "single indexing," five work stations are available for each piece, four stations being provided with the regular longitudinal tool slides and the fifth station with some other tool arrangement, cross-slide, cross drilling attachment or whatever is necessary to do the work or operation needed. In other words, either five lathe operations can be performed or four lathe operations and some other kind of operation on each piece. When set up "double indexing," two pieces would be unloaded and loaded at each cycle and two work stations or equivalent to two lathe operations would be available for each piece. If required, chucks or other holding fixtures can be used on the spindles in place of or, in some cases, in addition to the center.

The net weight of the machine is about 12,000 lb. and the floor space required is about 54x92 in. Either belt or motor drive may be had. Automatic bearing lubrication is provided as well as a pump and piping for cutting tool lubricant, when needed.

Rotor Type "B-O" Combination Pneumatic Tool

A pneumatic tool suitable for a large variety of purposes has been developed by the Rotor Air Tool Company, 5704 Carnegie Ave., Cleveland, Ohio. Six standard combinations are available for Duco rubbing and polishing, wire brushing, finishing stone, rubbing filler and light sanding operations, nut setting, and drilling. With a cupped brush, this tool is used for cleaning rust, paint and scale from tanks, steel cars, pipe and pipe lines, steel beams, and for removing sand from castings. With a pad and



disks, one of the chief uses of the tool is for mechanical rubbing of filler on castings, preparatory to painting, the operation being performed in much shorter time than by hand. It can likewise be used for light sanding operations on either metal or wood. Nuts up to $\frac{3}{8}$ in. can be set with the nut setting attachment, and drilling in close quarters can be performed with up to $\frac{3}{8}$-in. drills. The Type "B-O" pneumatic tool has speeds of 2,000, 1,500 or 1,000 r.p.m., as specified, and weighs 6 lb.

Sykes No. 1-A Gear Generator

Primarily for the automobile industry is the No. 1-A Sykes gear generator introduced by the Farrel-Birmingham Company, Inc., 344 Vulcan St., Buffalo, N. Y. This machine has a diameter range of $\frac{1}{4}$ to 12 in., and will cut all pitches from 24 D.P. up to and including 4 D.P. Precision is claimed at the high cutting speed of 850 strokes per minute. Besides the cutting of herringbone gears, the No. 1-A is adapted to cutting either straight-tooth spur gears or single helical gears.

Although the Sykes gear generators are noteworthy from the fact that they cut continuous-tooth herringbone gears having sharp apices, they will cut all other types of gears connecting parallel axes. Another feature is that most gears of a cluster combination can be cut simultaneously, as shown in Fig. 3. Both gears of such a combination can be cut at one operation, and the machine will handle them equally well whether the pitches are the same or different on each gear. It is also, of course, well adapted for cutting gangs of gears.

Two cutters are utilized. These are mounted face to face, as will be seen in Fig. 2, so that one cutter cuts on one direction of the stroke and the other on the opposite direction. Consequently, there is no lost motion.

Herringbone gears having a groove in the center of the face can be cut on the No. 1-A machine. Such gears can have a different pitch on the right-hand helice to that of the left-hand helice, and, therefore, the machine is especially suitable for cutting herringbone gears of what is known as the dual pitch type.

The main spindle is of large diameter and the hole clear through it is $3\frac{3}{4}$ in. diameter. A substantial support is provided for the outer end of the work arbor, and there is a relatively large distance from the end of the main work spindle to the arbor support when in its maximum position. This permits a wide range of work to be mounted in the machine. Pinions having long shafts, or combination gears of the cluster variety, in addition to spline shafts, can be handled easily. Gears integral with crankshafts can be cut and, of course, the machine is adapted for generating cams and other irregular shapes. Standard cutters employed for the machine are 4 in. in diameter, but cutters up to 6 in. may be used. Although the machine is listed for a maximum pitch of 4 D.P., it will cut 3 D.P. when cutters of a diameter larger than 4 in. are used.

Rapid action singalizes the No. 1-A. The number of strokes is 850 per minute. The work is fed automatically toward the cutters by suitable increments, which can be varied according to the material to be cut and the total depth of the teeth. The machine is stopped automatically after the work is finished, and simultaneously, the work is automatically withdrawn from the cutters. It is also claimed that ease of setting up has been provided. All adjustments and setting positions for the cutters are controlled by one handle. The guides, both of the helical and straight variety, used respectively for helical and straight-tooth gears, have double grooves instead of single grooves, as

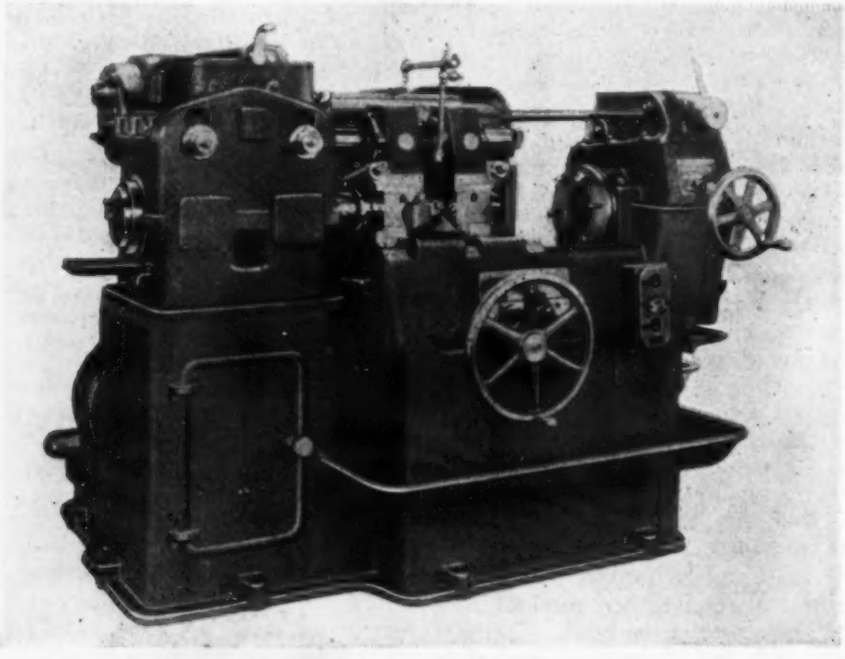


Fig. 1—Front view of the Sykes No. 1-A Gear Generator, which has capacities from $\frac{1}{4}$ to 12 in. in diameter and from 24 to 4 D.P.

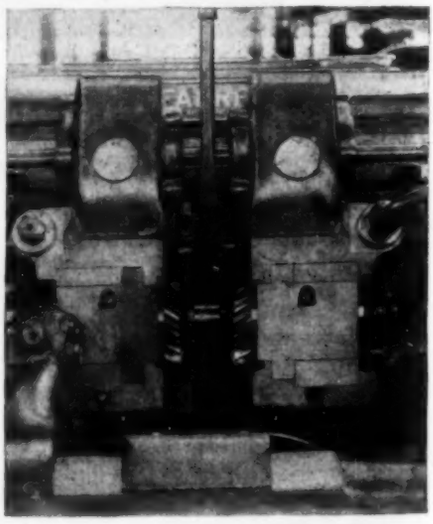


Fig. 2—Close-up of the two cutters employed in the Sykes No. 1-A gear generator, mounted face to face. One cutter cuts in one direction of the stroke and the other in the opposite direction

heretofore. The shoes engaging with these grooves are easily adjusted to eliminate backlash and to compensate for wear.

Cutter spindles are casehardened, ground, and lapped, and the bearings in which these spindles rotate are also casehardened and lapped. Nearly all the other wearing surfaces are made of casehardened steel. An improved relief mechanism has been adopted, which works positively and silently. When the cutters are in the cutting position, they are securely locked. It is claimed that precision gears can be obtained for the cost of

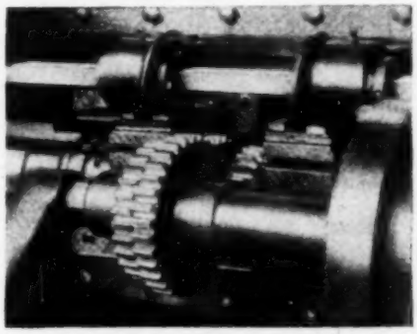


Fig. 3—Cutting cluster gears on the Sykes No. 1-A Gear Generator

ordinary commercial gears. All the index worms are casehardened and ground, and the index worm wheels are cut by the manufacturer on a special hobbing machine designed and built for the particular purpose of generating precision dividing wheels.

The floor space occupied is 6 ft. x 4 ft. 7 in., and the shipping weight is 7,500 lb.

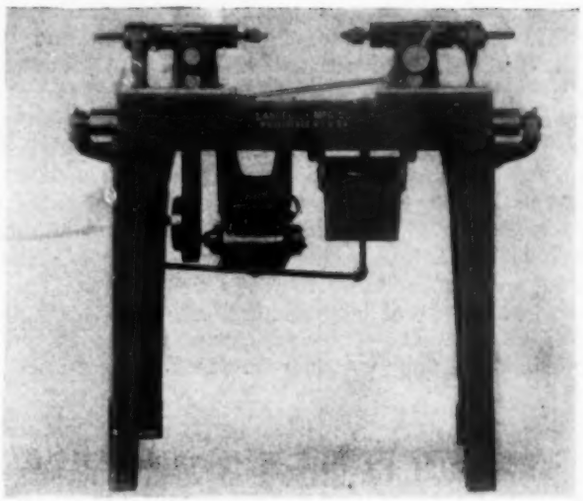
Langelier ⅜-Inch Horizontal Duplex Drilling Machine

Holes up to ⅜ in. can be drilled in steel on the horizontal duplex drilling machine developed by the Langelier Manufacturing Company, Providence, R. I. This production tool has a distance from the center of the spindles to the table of 6⅜ in., and the drilling heads can be adjusted to a working position from 3 in. minimum to 16 in. maximum between chuck ends. The distance from the floor to the center of the chuck is 44 in.

Gibbed T-slots are provided at each end of the bed, in which the drilling heads can be located and clamped in the desired position. The drilling spindles are hardened and ground and run in phosphor-bronze bushings. Deep-groove radial ball bearings are employed to counteract drill thrust. The spindles are mounted in feed sleeves and can be arranged to run at speeds from 1,200 to 6,000 r.p.m. Adjustable stops are provided on the feed sleeves for drilling to the required depth.

No. 2-A Jacobs chucks are fitted to the spindles, which are driven by ball-bearing pulleys mounted on sleeve trunnions clamped into the outer end of the feed sleeve bores. The pulleys carry driving collars, which have two keys engaging the splines in the driving end of the drilling spindles. Feed for both drilling heads is operated simultaneously by means of a connecting rod and levers mounted on the ends of the pinion shafts. These pinion shafts carry pinions which mesh with racks in the feed sleeves. The drilling feed is operated by a hand lever mounted on the end of the pinion shaft in the right-hand drilling head.

Drive to the spindles is from belts running over a long jack shaft located inside of the bed. The jack shaft runs on four ball bearing pillow blocks and carries a drum pulley at each end. Open and crossed belts are mounted on these pulleys and run to the spindle pulleys. The jack shaft is driven by a belt from the motor mounted underneath the bed on a swinging base plate. An oil tank is also attached to the underside of the bed and is piped to a gear pump mounted on the leg of the machine. Floor space occupied is 50x22 in., and the weight is approximately 525 lb.

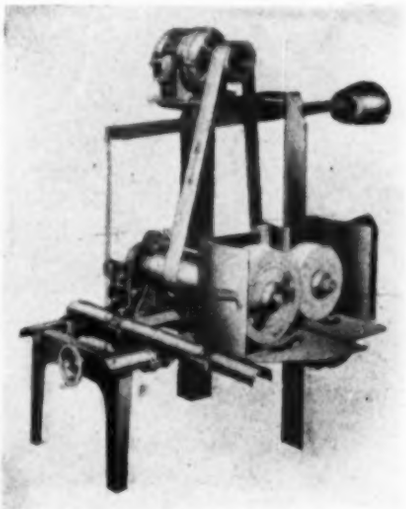


Langelier Horizontal Duplex Drilling Machine, which will drill up to ⅜ in. steel. Swing over table, 6⅜ in., minimum distance between chucks, 3 in., maximum distance, 16 in.

Excelsior No. 97 Polishing-Wheel-Surface Truing Machine

To retain the quality of polishing as well as to maintain production, a fast method of dressing the surface of polishing wheels must be had. To meet this need and also to effect reduced wheel maintenance cost, the Excelsior Tool & Machine Company, East St. Louis, Ill., has developed its No. 97 polishing wheel surface truing machine. It is claimed that felt, leather or fabric buff wheels can be trued to any shape by the use of a straight or master-shaped abrasive cutting wheel, to form the shape of the surface desired without burning or injuring the fabric. Wheels trued up on this machine require very little dressing after the true surface is obtained.

The dust hood is of a rigid construction, being of heavy sheet metal



Felt, leather, and fabric buffing wheels can be trued to any shape on the Excelsior No. 97 Polishing-Wheel-Surface Truing Machine

riveted and welded, with hinged doors easily opened for changing wheels. The top is provided with a 10x10-in., sliding, non-breakable glass cover so that the truing process is always in plain view of the operator. Spindles revolve in opposite directions, and are driven by an endless belt from a 7½-hp. motor. The polishing wheel spindle has a side oscillation movement of 2 in. in order to retain the straight surface of both grinding and polishing wheels. It is easily disengaged for truing irregular surfaced wheels. All the bearings have dust covers and are provided with grease cups. The entire machine is self-contained and dustless, and can be placed in the gluing room and connected to the dust suction system, or operated with a direct connected dust fan.

The standard machine will take up to 16-in. diameter by 6-in. face wheels. Shaft diameter for wheel ends is 1½ in. The abrasive wheel is 14x4x5-in. face. Height of the machine is 7 ft.; floor space, 6x6 ft., and weight 2,300 lb.

Murchey No. 98 Precision Threading Machine

Capacity to cut ½ to 1¼-in. threads in lengths up to 3 in. is embodied in the No. 98 precision threading machine announced by the Murchey Machine & Tool Company, Detroit, Mich. The machine is built to meet the demand for accurate "cut threads" produced uniformly on a steady production basis. It is particularly suitable for threading jobs requiring precision "cut threads" on work which previous to the threading operation has cost a considerable amount in direct labor and material, in other words where each scrapped piece would involve a considerable sum. It is claimed that threads can be cut on this precision machine with guaranteed accuracy at twice the usual speed and without spoiled work. The machine uses Murchey self-opening type CO dieheads or collapsible taps equipped with Murchey precision chasers.

The cutting action of the chasers is governed by means of a hardened and ground leadscrew ground to within 0.0001 per inch of lead. This leadscrew is mounted direct on the spindle. Because the lead is entirely dependent on the leadscrew, the chasers have no wear other than that of cutting the thread and therefore have their life extended appreciably.

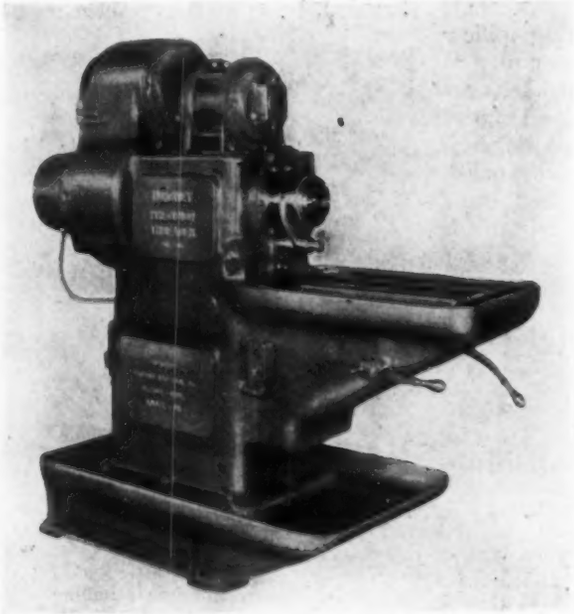


Fig. 1—Murchey No. 98 Precision Threading Machine, which has capacity for ½- to 1¼-in. threads up to 3 in. in length

If as a starting point for the sequence of operations, an idle machine is taken with the chasers closed, lead nuts disengaged, and the machine in neutral position, the operations are as follows: First, the machine is started by pressing the switch located on the left-hand side; second, by raising a lever handle, the segmental lead nuts engage the hardened and ground lead screw, this engagement giving the spindle its forward movement to cut the thread; third, by means of a spring this action is cushioned, allowing sufficient play between the leadscrew and lead nuts to permit them to mesh perfectly; fourth, stops on the machine are adjusted to a definite length, determining the length of thread to be cut; fifth, when the desired length of thread has been cut, the chasers and lead nuts open automatically and the spindle return worm automatically engages a ball thrust bearing, returning the spindle to its original starting position. The machine is then ready to be thrown in for the next cycle of operations.

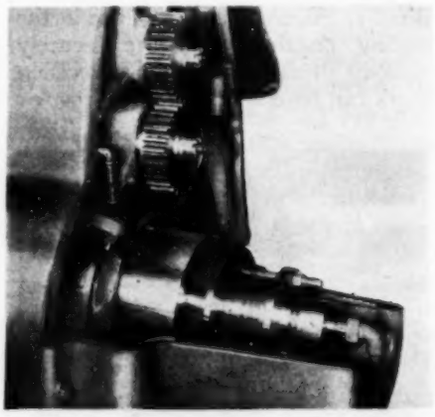


Fig. 2—Cover removed from the rear of the machine to show the pick-off gears, the leadscrew, and the leadscrew nuts. A stop for the length of thread is embodied in the right-hand lead nut

The segmental lead nuts, which in connection with the hardened and ground leadscrew control this machine, open and close in a manner similar to the chasers operating in a self-opening diehead. If it is found desirable, the segmental lead nuts may be removed and the machine operated manually. When different diameters are to be cut, necessitating a change in speed, this change may be obtained by using a different combination of the pick-off gears shown in Fig. 2. Because of their accessibility, the leadscrew, segmental lead nuts, chasers, and pick-off gears may all be changed in less than 30 minutes time.

The motors used are provided with magnetic reversing switches, making it possible to operate this machine either right-hand or left-hand. Combination right- and left-hand drives to the spindle and diehead are used, making it possible, by simply changing the chasers, leadscrew, and lead nuts to cut either right- or left-hand threads.

This machine is strictly motorized,

being sold as a unit with two motors installed. A 3-hp., 1,800 r.p.m., G.E. motor is used to drive the machine, and a ¼-hp., 1,800 r.p.m. type drives the pumps and the return worm shaft. Anti-friction, mechanical bearings are used throughout. The spindle obtains its drive through two hardened and ground rollers, rotating in longitudinal grooves 4 in. from the center line of the spindle. Friction is thus reduced to a minimum.

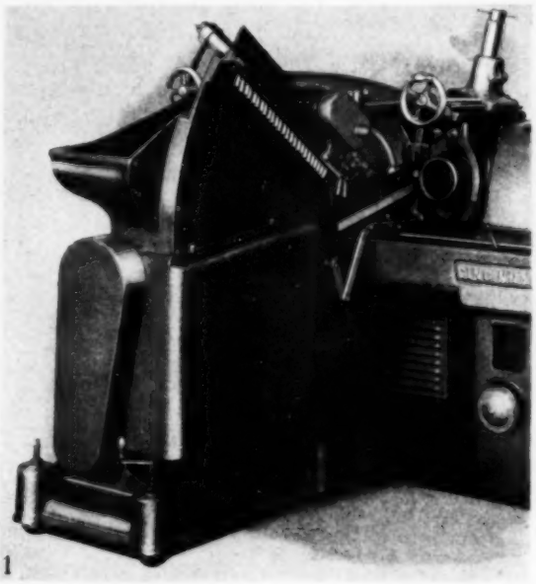
Improved "Feed-Matic" Thru-Feed and In-Feed Hoppers for Cincinnati Grinders

Improvements in the design of "Feed-Matic" thru-feed and in-feed hoppers for feeding work automatically to Cincinnati centerless grinders have been announced by Cincinnati Grinders Incorporated, Cincinnati, Ohio. By using these hoppers in conjunction with centerless grinders, manual feeding operations are eliminated, and, in cases where the hoppers are operated to feed a battery of machines, savings in labor are possible since one operator runs a series of three or four machines.

One of the major improvements is embodied in the low work basin, so that dumping of work into hoppers is easier for the operator. These improved hoppers are individually motor driven, easily removable from the centerless grinder, quickly adjustable for different sizes of work, and the mechanical arrangement is such that jamming of work or injury to the mechanism is prevented. Hoppers are mounted on adjustable wheels so that the unit can be moved from the grinder to any desired position. Anti-friction bearings are used, wearing parts are of hardened steel, and ample lubrication facilities are provided.

In Fig. 1 is illustrated the "Feed-Matic" in-feed hopper set up for feeding automatically headed or shouldered work to the Cincinnati No. 2 centerless grinder. Work up to 8 in. under the head, head diameters up to 2 in., and ground diameters up to 1½ in. can be handled. This hopper is powered by an individual, inclosed, ½-hp. motor with push-button control. The motor drives a pick-up plate traveling in a vertical segmental arc movement in the work basin. On each arc movement of the plate, work is selected with the shoulder end up. Pieces slide down a receiving chute and are placed in position on the work support blade.

The ejector rod on the automatic in-feed attachment controls the tim-



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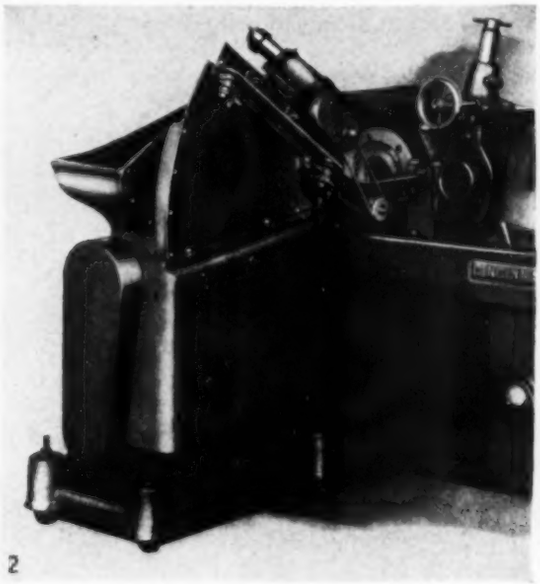

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Fig. 1—"Feed-Matic" In-Feed Hopper mounted beside a Cincinnati No. 2 Centerless Grinder. Work up to 8 in. in length under the head, head diameters to 2 in., and ground diameters to 1½ in. can be handled. Fig. 2—"Feed-Matic" Thru-Feed Hopper for straight cylindrical work

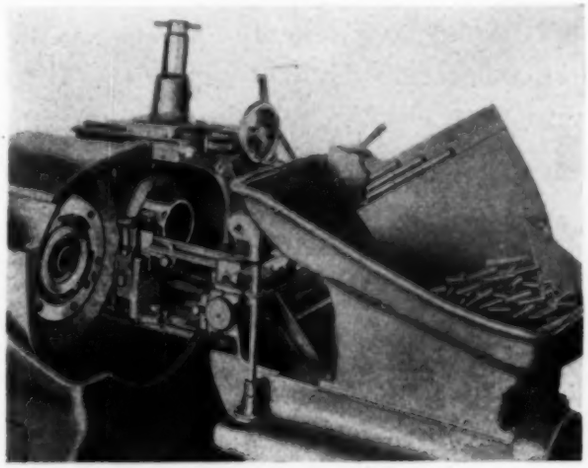


Fig. 3—Showing gravity chute on a "Feed-Matic" Thru - Feed Hopper, which causes straight cylindrical parts to slide down onto the work support blade

ing of the hopper. Thus the same cycle which controls the in-feed also controls the selection of pieces by the hopper. An essential part of the equipment is the Cincinnati automatic in-feed attachment, which cuts the idle time between grinding down to a minimum. In conjunction with the in-feed hopper, a suitable in-feed work rest with automatic ejector is used.

The "Feed-Matic" thru-feed hopper arranged for automatically feeding straight cylindrical work to a Cincinnati No. 2 centerless grinder is shown in Fig. 2. This hopper is identical in construction to the in-feed type, except that it does not have the arrangement for automatic in-feeding. Substituted for this mechanism is the gravity chute down which slide the straight cylindrical parts to the work support blade. This "Feed-Matic" thru-feed hopper takes work $\frac{1}{8}$ to $1\frac{1}{2}$ in. in diameter up to 8 in. long, the minimum length exceeding the diameter. An adjustable tie-rod keeps the hopper in proper position relative to the grinder. To compensate for wheel wear and to keep the hopper in alignment for accurate feeding, a cross adjustment is provided. If desired, additional parts may be obtained so that the in-feed hopper can be converted to a thru-feed hopper.

General Electric Semi-Automatic Welder for the Shielded Arc

An improved, portable, semi-automatic arc welding equipment, announced by the General Electric Company, Schenectady, N. Y., can be used for either open or shielded arc welding. A simple adjustment, requiring but a few minutes, is all that is necessary to make the conversion. This equipment was exhibited for the first time at the National Metal Exposition last week.

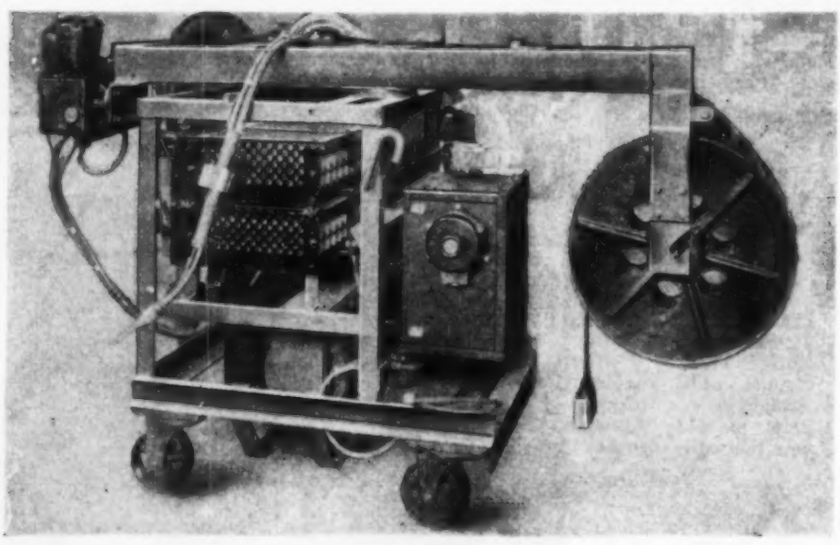
The equipment consists of a welding head for feeding the electrode, an inclosed line contactor with interlock, and a field rheostat for controlling the motor on the welding head, as well as a welding tool and lead for directing the electrode toward the work. The welding head is simply a motor-driven wire feeding device to supply electrode wire continuously to the arc. By means of a pair of geared feed rollers, the wire is drawn from a reel, these rollers being powered by a train of gears from an adjustable-speed, 60-volt, d.c. motor. The head is equipped with a gear shift for obtaining approximately the required rate of wire speed, the final adjustment being made by means of the motor field rheostat.

The welding tool and lead consists of a 10-ft. insulated flexible conduit with handle and nozzle, so that the operator can direct the electrodes at the work. A tumbler switch in the handle permits the operator to close or open the line contactor, starting the feed motor in operation. When it is desired to use the shielder arc, it is merely necessary to change two nozzle accessories.

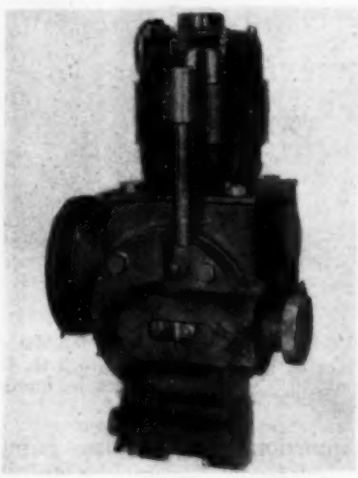
The rate of electrode feed can be adjusted for various sizes of wire. Although the equipment is mechanically capable of handling a $\frac{3}{16}$-in. electrode, the recommendation is limited to $\frac{5}{32}$-in. electrode. Either a constant energy or a constant potential welding set can be used as the source of welding current. The welding head control, however, will require a 60-volt constant potential source of power for the adjustable-speed 60-volt, d.c. motor.

Semi-automatic arc welding equipment can be used for welding applications in place of hand welding equipment where the latter is too slow, and where full automatic welding apparatus cannot be applied easily. The chief advantage is the continuous feeding of the electrode, thus eliminating the time lost in changing electrodes, as in the case of hand welding equipment. Among other applications, it can be used to advantage on welds that are too complicated for automatic welding. It can also be used to advantage on a line of products which varies considerably in shape and size.

The use of the shielded arc, which surrounds the weld with an atmosphere of hydrogen, minimizes the formation of harmful oxides and nitrides at the weld, and produces a more ductile joint.



Complete General Electric Semi-Automatic Welding Equipment for either the open or shielded arc



G.E. Electrode Feeding Device

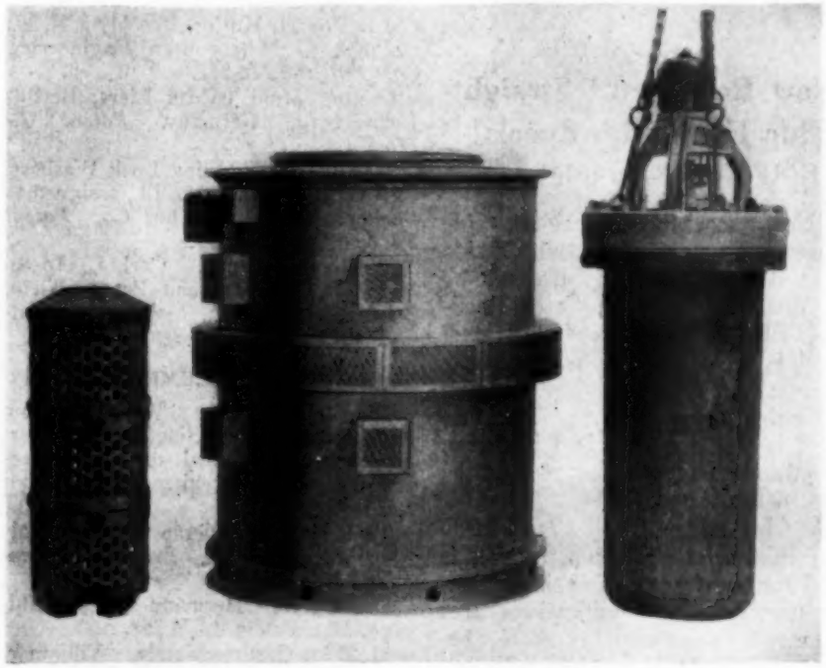
Hevi-Duty Vertical Pressure-Carburizing Furnace

The vertical pressure-carburizing furnace developed by the Hevi-Duty Electric Company, Milwaukee, Wis., is a standard crucible type, having elements mounted in the side walls, which radiate and reflect the heat directly to the retort. A three-section alloy basket, in which the charge is placed, fits into a nickel-chromium retort bolted and sealed air tight to the cover. The cover has a motor-driven fan for circulating the carburizing gases throughout the entire charge. Packing glands and the motor mounting on top of the cover facilitate maintenance and adjustment, and permit the furnace to be dropped in a pit to obtain convenient operation.

Carburizing gas is premixed in an automatic device with a predetermined amount of air and compressed to 10 lb. per sq.in. It is then delivered through the furnace cover to the charge, where the mixture is cracked into hydrocarbons and the carbon absorbed. The amount of carbon in the case is controlled by the air ratio, varying uniformly from the core to the outside of the case.

The carbon penetration takes place rapidly. On continuous operation approximately four heats can be run in 24 hours on ordinary normalized carburizing steels, with a penetration of approximately $\frac{1}{16}$ in. at a retort temperature of 1,675 deg. F. In an over-night shut-down, the temperature drops to about 1,000 deg. F., and can be brought back to normal operating temperature in approximately one hour.

The electric vertical pressure carburizing furnace is manufactured and sold by the above mentioned concern, under license agreement with the American Gas Furnace Company, Elizabeth, New Jersey.



Three-section alloy basket, furnace body, and nickel-chromium retort comprising the Hevi-Duty Vertical Pressure-Carburizing Furnace

TRADE PUBLICATIONS

ACCIDENT INVESTIGATIONS. The Department of Labor of the State of New York has prepared through its Bureau of Industrial Hygiene, Albany, two booklets on accident investigations. The first is a special bulletin on "Accidents in Metal Stamping and Forming Plants in 1930 with Suggestions as to Prevention." Many different types of safety devices are shown applied to punch presses. The second bulletin is on "Hand Tool Accidents of 1930, Their Cause and Methods of Prevention." Many photographs are given, illustrating the proper use of hand tools and improper construction of the same.

AIR CLEANERS. The Centrifix Corporation, 3029 Prospect Ave., Cleveland, Ohio, has issued Bulletin No. 158, describing the "Centrifix" compressed air cleaner for attachment to pipe lines.

CHAINS, SILENT AND ROLLER. The Union Chain & Manufacturing Co., Sandusky, Ohio, has issued a 124-page catalog on silent and roller chain, containing complete specifications and engineering data for design purposes, and also engineering data on sprockets and chain attachments for special purposes.

CRANES. The Whiting Corporation, Harvey, Ill., has issued a new bulletin N-2075 on its "Hi-Lo" crane, which features high lift with low headroom.

DIEHEADS. The Landis Machine Co., Waynesboro, Pa., has issued Bulletin No. F-71 on "Landmatic Heads for Turret Lathes and Screw Machines," giving the salient features, stressing the taper attachment and other attachments, and listing the various sizes manufactured.

DIE CASTINGS. The Aluminum Company of America, Pittsburgh, Pa., has issued a bulletin "Alcoa Aluminum Die Castings," discussing the various properties of these products, showing representative examples, and discussing the alloys and design principles.

FINISHES. The Norfolk Paint & Varnish Co., Norfolk Downs, Mass., has published a booklet containing solutions to various painting problems, among which are many in the field of product design and industrial requirements.

GEARS, INVOLUTE. The Fellows Gear Shaper Co., Springfield, Vt., has available a fifth edition of the "Involute Gear," which has been completely revised and contains considerable new material. It is a fundamental treatise dealing with the involute curve and its application to gear teeth.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued bulletins as follows: GEA-38B, superseding 38A, on "D.C. Crane and Hoist Motors Type CO-1820"; GEA-1277, superseding 61512, on "Fractional-Horsepower Motors and Motor Parts for A.C. and D.C. Operation"; GEA-1303A, superseding 1303, on "Squirrel-Cage Induction Motors," and GEA-1318 on "Quartz-Rod Thermostat for Use with Metal-Melting Pots."

GRINDERS, SURFACE. The Blanchard Machine Co., 64 State St., Cambridge, Mass., has issued Form 67 on its No. 16

high-power vertical surface grinder, covering the work done, the construction, and the specifications. A great variety of objects are illustrated for which the process is suitable.

LABOR LITIGATION. The U. S. Department of Labor, Bureau of Labor Statistics, now has available Bulletin No. 517 entitled, "Decisions of Courts and Opinions Affecting Labor 1927-1928," which is the fourteenth of the series. A complete list of cases is not presented, but rather illustrative ones embodying the principles under consideration.

MOTORS, TOTALLY INCLOSED. The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has issued Leaflet 2124 on its type "ARZ" totally enclosed, fan-cooled motor, showing the construction of this type, which is particularly suitable for very dirty locations.

NICKEL ALLOY STEEL FORGINGS. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has available No. 17 on its Nickel Steel Data and Application series entitled, "Nickel Alloy Steel Forgings," giving a comparison of normalized nickel steel and carbon-steel forgings, a list of uses, analyses, heat-treatment, and properties.

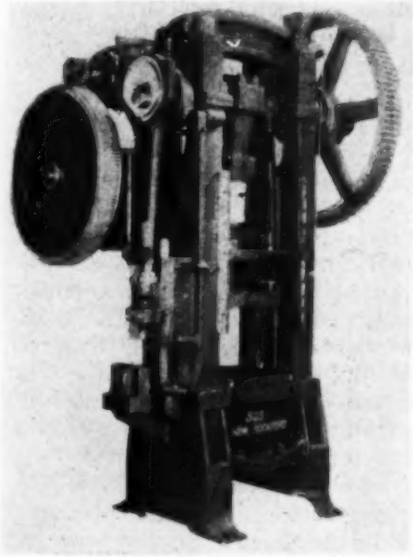
OVENS, CONVEYOR-TYPE. The Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn., has issued Bulletin No. 10 describing the features of "Despatch" conveyor ovens of the elevated and tunnel types used for various baking and drying processes.

PYROMETERS. The Brown Instrument Co., Philadelphia, Pa., is the publisher of Catalog No. 15A on its indicating, recording and controlling pyrometers, containing 104 pages with 141 illustrations, many of which are in colors. A comprehensive résumé of the theory and practice of applied pyrometry is presented, together with descriptions and illustrations of all instruments, and allied equipment.

SHEARS. Big billet shears are stressed in catalog FV-1930 published by the Henry Pels & Co., Inc., 90 West St., New York, N. Y. This line covers shears for 2½ to 9¼ in. rounds.

TEMPERATURE CONTROL DEVICES, AUTOMATIC. The Brown Instrument Co., Philadelphia, Pa., now has available a booklet, "The Era of Automatic Control," which is mainly made up of pictures showing automatic control apparatus applied in a wide range of industries. Types of controls are also illustrated.

TOOLS, MULTIPLE-CUTTER. The Lovejoy Tool Co., Inc., Springfield, Vt., is now distributing a booklet entitled "Meeting Milling Cutter Requirements," covering the complete Lovejoy line of standard and special multiple-cutter tools. Illustrations of tungsten-carbide applications, special counter-boring tools, and a grinding angle chart are given.



"New Rockford" No. 505 Straight-Side Single-Crank Press with Side Shear Attachment

"New Rockford" Straight-Side Press with Special Side Shear Attachment

"New Rockford" straight-side presses are now available with a side shear attachment. They are built by the Rockford Iron Works of Rockford, Illinois. The press illustrated, which is a No. 505 size, was specially arranged for the purpose of bending and sizing claw hammers. This machine is single geared and is driven directly from a motor mounted on the back of the frame.

As in other "New Rockford" presses, steel tie-rod construction is used for the frame. In this particular machine the specifications are: distance between uprights, 26 in.; between gibs, 21 in.; stroke, 5½ in.; adjustment of slide, 3½ in.; area of bed, 26x26 in.; and bed opening, 14x14 in. With the stroke down and the adjustment up, the distance between the bed and the slide is 14 inches.

A 45x6-in. flywheel is used, weighing 1,250 lb. With a speed of 315 r.p.m. of the flywheel and a 7-to-1 gear ratio, the strokes per minute are 45. At the bearings, the formed crankshaft is 5 in. in diameter; at the crank pins, 7½ inches.

For the cut-off attachment shown, the stroke is 3 in. and the adjustment of the slide is 2 in. With the stroke down and the adjustment up, the distance between cutter seats is 12½ in., while the center distance of slide to upright is 8½ in. The press weighs approximately 18,000 pounds.

PATENTS

SEPTEMBER 23, 1930

METAL-WORKING MACHINERY

Cushioning Device for Presses. Fredrich J. Rode, Chicago, Ill., assigned to Marquette Tool & Manufacturing Co. *Patent 1,776,271.*

Rolling Mill. Lorenz Iversen, Pittsburgh, Pa., assigned to Mesta Machine Co. *Patent 1,776,436.*

Sanding Machine. Raymond A. Reid, Cedar Rapids, Iowa. *Patent 1,776,450.*

Welding Machine and Method. Henry S. Holmes, New York, N. Y., and LeRoy H. Hoffer, Brooklyn, N. Y., assigned to Metropolitan Engineering Co. *Patent 1,776,587.*

Casting Mold. Fritz Liers, Berlin-Lichtenberg, Germany. *Patent 1,776,591.*

Machine for Forming Lock Washers. Carl G. Olson, Chicago, Ill., assigned to Shakeproof Lock Washer Co. *Patent 1,776,663.*

Welding Machine. Carl L. Ipsen, Verni J. Chapman, and Pearce Klein, Schenectady, N. Y., assigned to General Electric Co. *Patent 1,776,731.*

TOOLS AND ATTACHMENTS

Die Holder for Wire-Drawing Benches. Charles Siegfried, Geneva, Switzerland, assigned to Les Frères Bréguet, Geneva, Switzerland. *Patent 1,776296.*

Tool Holder. Pierre Elie François Rauzières, Clamart, France. *Patent 1,776,335.*

Drilling Jig. Hermann Deutsch, Chicago, Ill. *Patent 1,776,351.*

Mold for Casting Metals. William F. Eppensteiner, Rahway, N. J., assigned to The American Metal Co. *Patent 1,776,355.*

Counterbore. Alexander L. Geitner, Rochester, N. Y. *Patent 1,776,499.*

Jig for Forming Closely-Spaced Holes. George W. Booth, Baltimore, Md., assigned to Crown Cork & Seal Co., Inc. *Patent 1,776,537.*

Heating of the Rolls of Metal-Rolling Mills. Kenneth Younghusband, Hawarden, Wales. *Patent 1,776,607.*

Chuck. Thomas D. Bascom, Cleveland, Ohio, assigned to The Standard Tool Co. *Patent 1,776,675.*

Method for Producing the Teeth on Files, Saws, and Similar Tools. Paul Unger, Remscheid, Germany. *Patent 1,776,711.*

NEWS OF THE WEEK

High-Chromium Alloys Hold Stage At 12th National Metal Congress

CHICAGO, Sept. 26. — High-chromium alloys still hold the center of the stage at this year's National Metal Congress, now nearing its close here. Both the show itself and the technical sessions—which the Steel Treaters, Metallurgical Engineers, Mechanical Engineers, and Welding Society members are holding—are well attended.

Problems in the production, machining, welding, and buffing of corrosion-resisting alloys have been discussed from numerous angles, for it becomes increasingly apparent that nearly all industries are to continue using such alloys in rapidly mounting quantities and in a great variety of analyses.

Arc-welding of aluminum, new developments in plastic molding methods and materials and the need for research looking toward better practice in polishing and buffing metals, especially by automatic means, are among other subjects actively discussed. There is evident interest also in electric motor standardization, and in motors adapted for flange-mounting.

An overflow crowd in the joint sessions devoted to the lecture by Professors Bordon and Busse of New York University on improved sales methods gave ample evidence that both the technical men and executives in the metal-working industries are keenly awake to the need for better selling.

Among the nominations for technical society officers announced at this meeting is that of John M. Watson, metallurgical engineer of the Hupp Motor Car Corporation, as president of the American Society for Steel Treating. Alexander H. d'Arcambal of Pratt & Whitney is named for director and vice-president, Wm. H. Eisenman to succeed himself as secretary, and B. F. Sheppard and F. B. Drake as directors.

H. J. Frende, metallurgist of the International Nickel Company, has been named to receive the 1930 Henry M. Howe gold medal for the best technical paper published in the A.S.S.T. transactions during the past year.

The Thirteenth National Metal week will be held in Boston, Sept. 21-25, 1931, according to W. H. Eisenman, secretary of the A.S.S.T. Headquarters for the congress will be in the new Statler Hotel, while the exposition will be on Commonwealth Pier as it was in 1924. Participating groups have not yet been announced.

Ranged around the basement, lobby, and main dining room of the Stevens Hotel were 200 exhibitors at the National Metal Exposition. Of the materials shown, the high nickel and

REFLECTIONS

Reflected in the waters below, and reflecting the debt of gratitude owed him by mankind, is the memorial to George Westinghouse in Schenley Park, Pittsburgh, to be dedicated on Oct. 6. Those who were associated with him and 55,000 employees of the Westinghouse companies contributed to the memorial

chromium alloys predominated, chiefly in the form of furnace trays, grids, pots, and rollers. One new material in this group was of a modified composition that could be poured in relatively thin sections, $\frac{1}{16}$ to $\frac{1}{4}$ in., producing a light pot that compared favorably in weight with a pot of welded sheets, but which had the rigidity of a cast pot.

Next in interest were the steels and irons of the 18-8 chrome-nickel series. While nothing radical was indicated, a marked gain in the number of exhibitors offering this material was apparent. Several etched and lacquered or veneered panels in this material were on display for architectural interior effects. Structural materials included a new manganese-vanadium steel of high tensile strength, as well as copper-manganese alloys of aluminum. A new alloy of cast iron containing nickel, copper, and chromium, with a coefficient of expansion close to that of the aluminum alloys for pistons, was exhibited in the form of airplane engine cylinder sleeves. Besides the obvious advantage of maintaining uniform running clearances at extremes of temperatures, the metal had an appreciable amount of ductility and could be deformed cold without fracture. A molybdenum cast-iron for similar applications was also exhibited.

While no marked improvements in heat-treating equipment, other than refinements in detail, were seen, several manufacturers displayed nitriding equipment to co-ordinate interest with several technical sessions on the subject.

The number of exhibitors was markedly less this year than last and the attendance smaller, but the general impression was that those who visited the show were serious in their inquiries, and many indicated a serious intent to buy if the material of the desired performance could be found.

Trade Ass'n Executives Hold Eleventh Convention

The American Trade Association Executives held their eleventh annual convention at the Clifton House, Niagara Falls, Ont., from Sept. 24-27, with a general theme of, "The Trade Association's Part in Bettering Business Conditions." General sessions included: "Facts—The Basis for Business Improvement," "Distribution," "Technical Service Associations," "Local Associations," "Business Practices," and an open clinic. A number of special dinners and entertainment features were included.

THE American Standards Association recently published a report of the May, 1930, Paris Conference of the International Standards Association made by John Gaillard of the A.S.A. staff, who attended the Conference on behalf of the association. Copies of the report are available through the A.S.A. office.

Railroad Shop Foremen Discuss Maintenance

Discussion of various problems relating to the maintenance of locomotives and cars was had at the 4-day session of the International Railway General Foremen's Association, held in Chicago, Sept. 16-19. H. B. Sunderman, of the Chesapeake and Ohio Ry., and president of the association, presided at all the meetings. Because of the rigid economy being practiced by the railroads this year, the attendance was much lower than in previous years, although discussion was lively.

For the coming year, A. H. Keyes of the Baltimore & Ohio R.R. was elected president. The four vice-presidents elected were: A. T. Streeper, of the New York, Chicago & St. Louis R.R.; W. J. McCloskey, of the Illinois Central R.R.; C. M. Hillman, of the Minneapolis & St. Louis R.R.; and A. R. Slack, of the New York, New Haven & Hartford R.R. Mr. Sunderman, retiring president, is chairman of the executive committee for the coming year. Under him are to serve: J. H. Armstrong, F. M. A'Hearn, C. A. Barnes, and E. J. Burck.

Railway Expenditures and Freight Loading Increase

Capital expenditures by Class I railroads of the country in the first six months of 1930 for new equipment and additions and betterments to railway property totaled $468,305,000. This is according to a report submitted at a meeting at the Shelburne Hotel in Atlantic City recently of the Advisory Committee of the Association of Railway Executives. Capital expenditures made during the first half of 1930 were an increase of $118,000,000 over those for the same period in 1929. Of the total, $187,486,000 were expended for new equipment, while $280,819,000 were expended for roadway and structures.

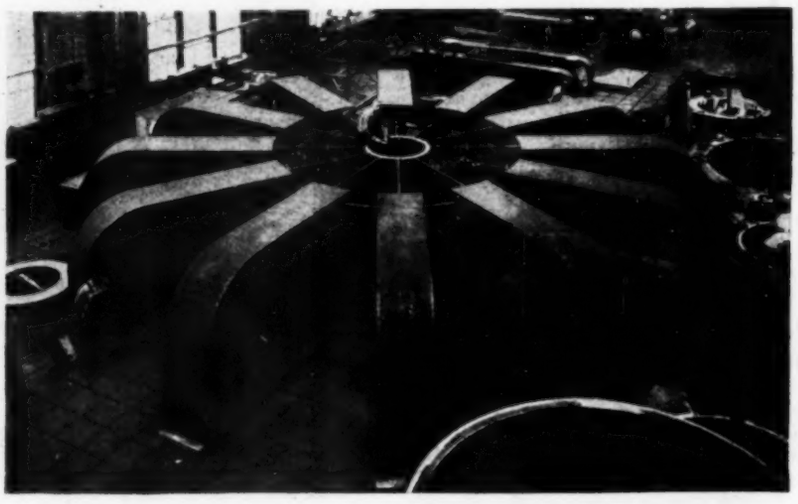
Loading of revenue freight for the week ended Sept. 13 totaled 965,713 cars. This was an increase of 109,076 cars over loadings of the preceding week. It was, however, a decrease of 187,561 cars below the same week of last year and a reduction of 172,347 cars compared with 1928.

Tool Builders Confer on Costs

Do machine tool builders approve of standard costs in principle? If so, what general methods are to be followed? It was necessary to answer these questions before the finishing touches could be put on the forthcoming cost manual of the National Machine Tool Builders' Association. Accordingly, the entire time of the association's cost conference, held at the Hotel Clifton, Niagara Falls, Ont., on Sept. 22 and 23, was devoted to this subject.

E. R. Smith, vice-president of the Seneca Falls Machine Co., presided, and confined discussion strictly to the subject at hand when wage incentives and similar topics threatened to becloud the issue. A. E. Grover, cost consultant of the association, directed the course of the meeting with a series of wall charts illustrating cost forms to serve as a basis of discussion. Most of those present approved the theory of predetermined costs, but it developed that few had actually applied them in their own concerns. The charts brought out many divergent views on methods which led to a friendly threshing out of individual opinions.

In closing, a problem on repair part pricing was brought up. Mr. Grover had mailed copies of the problem to members of the association prior to the conference and had received about 40 solutions. The wide difference in results served to emphasize the need for more uniform cost methods within the industry.



The 235,000-lb. thrust bearing bracket of an 84,000-hp. hydro-electric generator for the Dneiper River station in Russia, under construction at the Schenectady works of General Electric. The completed unit will weigh 1,750,000 lb.

Dill Bill to Meet Strong Opposition—Canadian Tariff Raises Questions

PAUL WOOTON
Washington Correspondent

WASHINGTON, D. C., Oct. 1.—In the Dill bill proposing to suspend patent rights when the holder is violating the anti-trust statutes is seen the most extreme anti-trust legislation yet proposed. By suspending returns from patents, or by creating uncertainty as to their ultimate value, penalties under the Dill bill would run enormously higher, in some instances, than any penalty provided by the Clayton act. While this measure was passed by the Senate at the last session of Congress, before its far-reaching possibilities were appreciated by most of the members of that body, the measure was recalled from the House and will face strong opposition when it is taken up at the December session.

The measure proposes that anyone sued for infringement of patent has a complete defense if he can prove that the patent owner is violating any of the anti-trust statutes. The bill provides further that the anti-trust case must be tried in advance of the patent infringement case.

To say that Washington is disturbed by the Canadian tariff underestimates the effect that Premier Bennett's first retaliatory blow has had upon observers who look to the economic effects of political strategy. They have not had time to estimate the dollars-and-cents result that the new Canadian rates, running the whole gamut of our exports to the Dominion, may have upon that trade, but they fear that it will make a billion-dollar market look sick. They comment sourly on Senator Watson's confident assertion that a conservative victory in Canada would not harm the United States.

There is no disposition to conceal the belief that Canada's action was invited by the American Congress and though both countries will suffer immeasurably, there is no disposition either to blame the Dominion parliament for lacking foresight that the American Congress did not possess.

First impressions of the new United States Tariff Commission indicate that a more liberal policy may be in the making through the flexible provisions whereby unreasonable rates may be lowered. President Hoover has stressed the need of giving quick attention to such rates as approach embargo level and thus have worked hardships both on United States importing groups and upon foreign countries which have been deprived of an outlet for their goods. Several items of importance to Latin America are being investigated under the tariff flexible provisions.

With the foundation laid by the returns from the Census, a demand has arisen for a study of industrial marketing. This is a phase of distribution concerning which few figures are available. Industry buys differently from the ordinary consumer and offers a profitable field for study.

Attention just now is being given a plan to tabulate data from the census of manufactures by small areas. With precise information as to the character of the manufacturing plants in each of these small areas it will permit of close analysis of industrial marketing possibilities.

Canada Introduces Protective Steel Tariff

BY OUR CANADIAN CORRESPONDENT

According to the new tariff schedules, just introduced by the Canadian Government at the special session of Parliament, the iron and steel industries will be provided ample relief from foreign competition, particularly in connection with those commodities that come in from Continental Europe. The increases range all the way from 10 to 50 per cent. Increases in the tariffs on agricultural implements range from 20 to 50 per cent. There is a general tariff increase of 5 per cent on electric fixtures and appliances. The enumerations of some iron and steel products, and the several rates of customs duties giving the new British preference, intermediate and general tariffs respectively, are as follows:

Plates, of iron or steel, hot or cold rolled: Not more than 40 in. in width, N.O.P., per ton, $4.24, $6.00, $7.00.

Iron or steel shapes or sections, as hereunder defined, not punched, drilled or further manufactured than hot rolled, weighing not less than 35 lb. per lineal yard, viz.: I-beams, beams up to and including 6 in. in depth, but not to include H sections; channels, up to and including 7 in. in depth; angles, up to and including 6 in. by 6 in., zees, up to and including 6 in. in depth of web, per ton—$4, $6, $6.

Iron or steel angles, beams, channels, columns, girders, joists, piling, tees, zees, and other shapes or sections, not punched, drilled, or further manufactured than hot rolled, n.o.p., per ton—$4.25, $7, $7.

Iron or steel angles, beams, channels, columns, girders, joists, piling, tees, zees, and other shapes or sections, punched, drilled or further manufactured than hot rolled or cast—25 per cent, 35 per cent, 40 per cent.

Internal combustion traction engines for farm purposes, valued at not more than $1,400 each; traction attachments designed and imported, to be combined with automobiles in Canada for use as traction engines for farm purposes; and complete parts of all the foregoing: Free, Free, Free.

Portable engines with boilers, in combination, for farm purposes; horsepower and traction engines for farm purposes, n.o.p., and complete parts of all the foregoing: Free, 15, 25 per cent.

Traction engines and complete parts thereof, n.o.p.—Free, 15, 25 per cent.

A.S.M.E. 1931 Officers Selected by Members

The election of officers of the American Society of Mechanical Engineers for 1931 was announced by the tellers of the election on Sept. 23, after canvassing the ballot. New Society officers are: President, Roy V. Wright; vice-presidents, William A. Hanley, Thomas R. Weymouth, Harvey N. Davis; managers, W. L. Batt, H. L. Doolittle, L. Whittemore.

ROY V. WRIGHT

Production Session Planned In Detroit by S.A.E.

The Society of Automotive Engineers is holding its Ninth Annual Production Meeting on Oct. 7-8 at the Book-Cadillac Hotel in Detroit. Included in the papers to be presented are: "New Developments in Machining Aluminum and Its Alloys," by R. L. Templin; "The Future Development of Tungsten Carbide as a Cutting Tool," by W. H. McCoy; "The Effect of Time on Production Cost," by Paul N. Lehoczky, and "The Tool Engineer's Place in Mass Production," by O. B. Jones. The first two of these papers will be presented at the morning technical session on Oct. 7 and the remaining two in the economics session that afternoon. The program for the following day shows two papers to be presented at the morning technical session, including "Conveyors in the Automotive Industry," by J. H. Hough; and "Wear Allowances and Tolerances on Gages," by E. J. Bryant.

BUSINESS ITEMS

Contract has been awarded for the erection of an addition of a manufacturing unit to the Ford Motor Company's assembly plant at Los Angeles-Long Beach Harbor. Work is to start at once, the building to be ready for occupancy by Feb. 1, 1931. The structure, which will cost approximately $170,000 with equipment and machinery, will be known as the pressed steel building and will be used for the manufacture of pressed steel parts. The building will be 86 ft. wide, 480 ft. long, and 48 ft. high.

The General Electric Co. will occupy Booths 76, 77, 134, and 135 at the International Petroleum Exposition in Tulsa, Okla., Oct. 4-11. W. A. Gluesing will be in charge.

The Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, is now prepared to furnish products manufactured by the Continental Tool Division equipped with cutting faces of Carboloy, a cemented tungsten-carbide alloy, through an arrangement with the Carboloy Co.

The Apex Sheet Metal Works, 933 Twelfth Ave., Seattle, Wash., is planning the erection of a frame plant building at 912-16 Twelfth Ave., one story high, occupying an area of 120x60 ft.

The Interstate Machinery Co., 601 W. Monroe St., Chicago, Ill., has taken additional space at 130 S. Clinton St., where it eventually expects to move its entire activities.

The Boston & Maine Railroad Co., East Cambridge, Mass., is planning to centralize work on passenger cars at its shops in Concord, N. H. The change is said to involve an immediate expenditure of $400,000.

Construction of a shop building for the Western Automatic Sprinkler Co., 204 No. Los Angeles St., Los Angeles, is to be started shortly. The site is on East Twelfth St., near Soto St., that city.

The Norton Co. of Canada, Ltd., Hamilton, Ont., has broken ground for a new addition to the plant.

The Stratford (Ont.) Engineering Co., Ltd., of which W. I. Kemp is the head, has recently acquired a factory building at Elmira, Ont., and has equipped it.

The American Manganese Steel Co., Chicago Heights, Ill., has moved its Cleveland office to Room 909, Midland Bank Bldg. A. R. Sittig is Cleveland manager.

The Westinghouse Electric & Manufacturing Co. has purchased the plant and equipment of the New Home Sewing Machine Co., Orange, Mass., which was recently vacated when the company removed to Rockford, Ill.

The Saginaw (Mich.) Steering Wheel division, General Motors Corporation, plans expansion of plant facilities at an estimated cost of $500,000.

The Baker Oil Tools Co., Inc., East Slauson Ave., Huntington Park, Los Angeles, is to start the erection of additional plant facilities, including among other units a 2-story office building.

The Mesta Machine Co., Homestead, Pa., has begun construction of a new 60x300 ft. erection unit.

Five units of the Union Carbide & Carbon Corporation, 30 E. 42nd St., New York, will exhibit jointly at the International Petroleum Exposition.

Gears & Forgings, Inc., Cleveland, recently announced the concentration of all its heavy gear and special machinery production at its Ford City plant. The Pittsburgh branch office will remain in its old location.

Hunt, Helm, Ferris & Co. Inc., Harvard, Ill., will erect a 1-story and basement addition to cost, with equipment, about $40,000.

PERSONALS

E. V. Ahara, formerly with the Ruths Steam Storage Co., Toronto, Ont., is now connected with the Abitibi Power & Paper Co., Ltd., Toronto. Mr. Ahara was at one time mechanical engineer with the Combustion Engineering Corporation, Toronto.

Alexander H. d'Arcambal
New vice-president, A.S.S.T.

W. J. Coles, director of Edgar Allen & Co., Ltd., Sheffield, England, arrived in New York on Sept. 16 for a visit of one month. His headquarters will be at the New York office of the company at 741 Washington St. Mr. Coles attended the National Metal Congress, Chicago, last week, also visiting Chicago and Detroit branches at that time.

Alfred J. Forschner, formerly owner and proprietor of the Alfred J. Forschner Co., Philadelphia, who became affiliated with the Philadelphia office of McMyler-Interstate Co., Cleveland in 1926, has been made vice-president and secretary of the Atlas Conveyor Co., Inc., Philadelphia.

John J. Cone, president of the Robert W. Hunt Co., and a member of that company since its organization in 1888 has retired. C. B. Nolte, vice-president and general manager, has been elected president and general manager, with headquarters at the general office, 2200 Insurance Exchange, Chicago. J. C. Ogden, a director and eastern manager, has been elected vice-president with headquarters at New York City.

George E. Kincaid, works manager of the Oil Well Supply Co., Oil City, Pa., has resigned. B. T. Enos, formerly assistant manager, will succeed him.

Frederick M. Kreiner, treasurer of Manning, Maxwell & Moore, Inc., New York City, since 1920, was elected a vice-president at a meeting of the executive committee on Sept. 23. Mr. Kreiner, who has been connected with the company since 1903, will continue his duties as treasurer.

E. S. Marks of the H. H. Franklin Manufacturing Co., has been nominated as vice-president of the Society of Automotive Engineers, representing passenger car engineering. John A. C. Warner, now secretary and general manager of the Society, was nominated at the summer meeting at French Lick to occupy this office.

Herbert A. May, Pittsburgh, has been elected a director of the Union Drawn Steel Co., a subsidiary of the Republic Steel Corporation, to succeed the late George Davidson. The alloy steel sales division of Republic was transferred to Massillon from Youngstown, in charge of J. M. Schlendorf, on Sept. 29.

L. B. Mead has been appointed assistant industrial manager of the Northwest district of the Westinghouse Company with headquarters in Indianapolis. Wm. J. Morgan becomes Indianapolis manager.

Arthur Miltner has been appointed factory manager of the Saginaw (Mich.) Steering Gear Co., a unit of the General Motors Corporation. He was formerly personnel director of the Olds Motor Works, Lansing, Mich. Dane H. Hoover succeeded him there.

James W. Owens, formerly welding aide for the Bureau of Construction & Repair of the U. S. Navy, has resigned as director of welding at the Newport News Shipyards to become associated with the Welding Engineering & Research Corporation, 25 W. 43rd St., New York, N. Y., as director of engineering and secretary. Prof. Comfort A. Adams is president of the new company, J. H. Deppeler, vice-president, and C. A. McCune, director of research and treasurer.

A. H. Pfeiffer of the Harnischfeger Corporation, Milwaukee, has been elected chairman of the new industrial relations and employment committee of the Milwaukee branch of the National Metal Trades Association, representing 25 plants. M. J. Dalton of the Chain Belt Co., is vice-chairman, and Francis Riley of the Vilter Manufacturing Co., secretary.

C. H. Ribble, for six years in charge of the New York office of the Industrial Controller Co., joined the New York staff of the Allen-Bradley Co., under C. N. Calkins, district manager, recently. He will work in New York City. George Breuer also joined the N w York office recently. He will confine his attentions to the Newark territory. The New York office is at 50 Church St. H. J. Staib, formerly connected with the Century Electric Co., has joined the sales staff of the Cincinnati office of the Allen-Bradley Co., under the direction of W. L. Jaeckel, district manager.

John M. Watson
New president A.S.S.T.

Roy E. Cole has resigned as chief engineer of Durant Motors, Inc. Until two years ago he was with Dodge Brothers as chief engineer.

Morris Stone, mechanical engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., received the second award of the Benjamin Garver Lamme scholarship, which provides one year's advanced study at any college or university in America or abroad.

Jerry J. Tobias, formerly vice-president of the Moto Meter Gauge & Equipment Co., Toledo, Ohio, has become assistant sales manager of the Federal Steel Corporation, Detroit.

C. Stuart Tobin, associated for 25 years with Froment & Co., New York, has resigned to engage in underwriting life insurance. Mr. Tobin's resignation will be effective after a few weeks. At present, he is assisting with final details of the merger of the Froment & Co., with Egleston Bros. & Co., Inc., Long Island City, N. Y.

W. A. Wilson, recently elected vice-president of the Lenney Machine & Manufacturing Co., Inc., Warren, Ohio, was with the Taylor Winfield Corporation for the past 20 years. In latter years he was production manager.

Logan H. Zintgraff, until recently with the Busch-Sulzer Brothers Diesel Engine Co., has been appointed St. Louis representative, with offices at 907 Security Bldg., of the Steel Improvement & Forge Co., Cleveland, the Globe Machine & Stamping Co., Cleveland, the Farrell-Cheek Steel Foundry Co., Sandusky, and the Terre Haute (Ind.) Malleable & Manufacturing Co.

OBITUARIES

Charles Curtiss Coventry, 65, president of the Cleveland (Ohio) Tool & Supply Co., died of pneumonia at his home in Cleveland on Sept. 18. He had been in the Cleveland machine tool industry for 35 years, 33 as head of the Cleveland Tool & Supply Co.

John Leonard Esson, 52, vice-president of Ford, Bacon & Davis, Inc., 39 Broadway, New York, died suddenly on Sept. 21 at his home in New York. His death came four days after that of the founder of the company, Frank R. Ford.

James Forrest, 69, engineer in charge of the flour mill division of the Allis-Chalmers Manufacturing Co., Milwaukee, died on Sept. 12 as the result of a stroke which he suffered while on a business trip in Minnesota. Mr. Forrest was associated with Allis-Chalmers for more than 40 years.

Thomas E. Swords, 48 prominent Rockford, Ill., manufacturer and contractor, died Sept. 11 in his home in that city following a three-days illness of heart disease. He was president and treasurer of Swords Brothers Co. and the Swords Electric Co.; president of the General Refrigerator Co., Beloit, Wis., and vice-president of the Sundstrand Engineering Co. and the Rockford Furniture Co.

Frederick D. Platt, manufacturing superintendent of the motor department, River Works, General Electric Co., West Lynn, Mass., died of pneumonia at Moscow, U.S.S.R., on Sept. 21. Mr. Platt was there with other American engineers as an advisor in motor production. He entered the employ of General Electric in 1899.

A. R. Button, 80, manager for 25 years of the Crescent Works, Cleveland, of the American Sheet & Tin Plate Co., and later with the Cleveland (Ohio) Hardware Co. for 13 years, died recently at his home in Cleveland.

Webster L. Marble, 75, founder of the Marble Arms & Manufacturing Co., Gladstone, Mich., died at his home in Escanaba, Mich., on Sept. 22.

James E. Evans, who has been with the S. Obermayer Co., 2563 West 18th St., Chicago, for almost 40 years, died recently after a brief illness.

C. D. Pillsbury, 38, sales agent for the American Brass Co. at Chicago, died recently after a short illness with appendicitis.

Caspar Mettler, 60, president of the Mettler Machine Co., New Haven, Conn., died on Sept. 15 of a heart attack.

Frederick Guilfoyl, for many years superintendent of the American Brake Co., St. Louis, died recently at his home in that city.

John Wilson, 47, president of the Thomas Robertson & Co., Ltd., Montreal, died at his home in that city on Sept. 22.

FORTHCOMING MEETINGS

ASSOCIATED MACHINE TOOL DEALERS Annual Convention, Hotel Aspinwall, Lenox, Mass., Oct. 6-7. A. G. Bryant, secretary, 2558 W. 16th St., Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

French Lick Meeting, French Lick Springs Hotel, French Lick, Ind., Oct. 13-15.

Fifty-first annual meeting, Engineering Societies Bldg., Dec. 1-5.

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

SOCIETY OF AUTOMOTIVE ENGINEERS—Production meeting, Hotel Book-Cadillac, Detroit, Oct. 7-8. R. S. Burnett, director, production activities, 29 West 39th St., New York City.

GRAY IRON INSTITUTE, INC.—Third Annual Convention at Hotel Cleveland, Cleveland, Oct. 8. A. J. Tuscany, Terminal Tower, Cleveland, manager.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—29th Annual Convention, Hotel Aspinwall, Lenox, Mass., October 13-15. Ernest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

SOCIETY OF INDUSTRIAL ENGINEERS—17th National Convention, Mayflower Hotel, Washington, D. C., Oct. 15-17. George C. Dent, 1815 Engineering Bldg., 205 W. Wacker Drive, Chicago, executive secretary.

STEEL FOUNDERS' SOCIETY OF AMERICA—October meeting at Pennsylvania Hotel, New York City, on Oct. 23, the day preceding the New York meeting of the American Iron & Steel Institute. G. P. Rogers, 932 Graybar Bld., New York City, is managing director.

NINTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING—In Grand Central Palace, New York City, Dec. 1-6. Charles F. Roth, manager, Grand Central Palace.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

NEW YORK

Optimism and pessimism in this market strain like twin greyhounds at their leashes. While some dealers have decided that even their best efforts are in vain, others are smiling for the first time in several months. Westinghouse is placing its orders for the Newark plant tool by tool with various dealers, and the Navy is also buying a few tools, but the week's prize order was American Locomotive's decision on 7 or 8 tools for the Schenectady plant, among them 5 radial drills and a planer, all to one dealer. Another progressive dealer reports sales of some dozen tools, most of them of a size to write home about. Several others report increasing business, one expecting several thousand dollars worth of municipal business. One of the largest dealers in the city reports the last week the best since May, with September sales for 3 weeks better than those for June, July, or August. Inquiries as such are not improving; what business is being gotten is the result of diligent digging, combined with remembrance by friends of good turns done them when times were better.

SOUTHERN DISTRICT

Changing seasons have wrought no encouraging change in the machinery and machine-tool market of this district. Sales continue scattered and below expectations for this time of year. The transitory period, during which poor business is anticipated to become better, appears fraught with slowness, and some circles predict that encouraging signs of rising sales will not be viewed until early in 1931. Skeptical buying and tightening of finances is the price reason for lessened activity, but lessened volume of general business is responsible for this over-cautiousness.

Prospects probably are better in the New Orleans district than anywhere else in the South. A hundred million dollars of road, building, and miscellaneous construction appears certain as a result of action by the Louisiana legislature. But it probably will not get under way until early 1931, and after all is predicated on a favorable general vote in November. Birmingham, Houston, and Atlanta continue quiet.

LOS ANGELES

So far as the machine-tool and shop equipment situation is concerned, this district remains in about the same condition as during the few months just past. Among other tools recently ordered or installed may be included a number of automatic screw machines, turret lathes, and punch presses. Inquiries show increasing interest. In regard to punch press orders and the like, this has always been recognized as a good punch press district on account of the considerable number of specialty shops and similar establishments producing metal stampings. Equipment recently supplied to certain oil-tool plants includes among other items some medium-heavy turret lathes.

BUFFALO

For the first time in the last half of the year there are real signs of an improvement of the machine-tool and electrical equipment business. Hopefulness for business, which had been stretched to the limit, seems at last to have some real justification.

There are no big jobs in the offing. Indeed, it is now understood that the equipment for the new Burgard Vocational School of Buffalo is not to be purchased in the departments involving machine tools until after Jan. 1, 1931.

Salesmen report a speeding up of some industries. The same condition applies in the electrical equipment field. In the contracting equipment field, conditions, which were so good, have turned slow.

■

PRECOCIOUS prognosticators and platitudinous pessimists may find equal authority in the present market for any predictions they might make. Last week's leopardlike spottiness continues, although a few more steps of the way from basement to belfry have been accomplished. Most New York dealers consider August the sub-cellar of the decline and report a few rays of business sunshine getting down to them, one ray being American Locomotive's 7-tool order, others sales aggregates far surpassing August's totals. New Orleans prospects are best in the slowly returning Southern market, seemingly imbued with Lightnin's slowness and Scrooge's penury. Los Angeles is inquiring but not buying as yet.

BUFFALO hopefulness seems justified in the speeding up of some industries, though several orders considered "in the bag" have popped out again. Canadian business, welcoming retributive tariff action, is improving in all departments, with public works and hydro-electric construction leading the way. Cincinnati working forces are increased in some cases, manufacturers have encountered less sales resistance, and selling agents are encouraged. One heavy-tool manufacturer is quite busy; other manufacturing is weakly trying to rise. New England is leading the optimistic van, with substantial automotive orders, radio and electrical industries buying, and worthwhile foreign inquiries. Even small tool sales are getting larger.

INDIANAPOLIS, having vision difficulties, sees little evidence of improvement, though operations are being stepped up and a wide range of industries are acquiring tools. Chicago sings a disappointed dirge in which Detroit heatedly and disgustedly joins.

CANADA

Leading machine-tool manufacturers report a fair volume of inquiries during the last fortnight, while sales are stated to have shown a marked improvement over the last two weeks in August. An outstanding constructive factor is the continuance of record activity in the construction of public works and hydro-electric installations.

The Canadian General Electric Co. reports that while current orders are running somewhat less than last year, they are still sufficient to maintain a good rate of production. Canadian Fairbanks-Morse Co., Ltd., reports that business on the Prairies shows a seasonal improvement. Dominion Engineering Works, Ltd., has a substantial volume of hydraulic business on its books. The automotive industry is slowly recovering from a period of comparative quietness.

CINCINNATI

According to a few of the machine-tool manufacturers of the Cincinnati district, sales efforts have been meeting with a slightly better reward in the past few days than for some time past. In a few cases a small number of men have been added to working forces, but, with the exception of a manufacturer of very large tools who who is quite busy, it cannot be said that there is any great manufacturing activity.

Selling agents state that although the demand continues low, they see some encouragement.

NEW ENGLAND

Orders are being placed at a better rate than that throughout August, but no great gains are being anticipated for September in machine-tool circles. Industrial conditions have made marked strides for the better from week to week with the automotive, radio, and electrical industries playing the most prominent part in latest developments.

General Motors, Chrysler, and Ford are among those companies that have placed substantial orders for machinery or parts in this territory. Foreign inquiry for grinding equipment is strong and domestic buyers are displaying more interest in this item. Small tool sales have picked up somewhat.

INDIANAPOLIS

There has been some improvement in machinery and machine-tool sales in this area during the last two weeks, but it is hardly visible. One encouraging feature, however, is that in spite of light buying, sales are to a wider range of industries than during the summer. Local trade is somewhat encouraged also because reports from all parts of the state indicate a gradual resumption of operations.

Some inquiries are being received for special machinery from the woodworking plants. The iron and steel industry is doing some buying, and if reports are true will be in the market on a larger scale during the next two months.

CHICAGO

There is little in the machine-tool situation that can be set down as encouraging, unless it be the number of inquiries. These seem tentative and seldom followed up within a reasonable time. What appeared to indicate that business was taking an upward turn proves to have been merely a spurt. September will close with a poor record. In a few cases only will totals show a gain over August. Buying is almost without exception for single tools for replacement. There is a belief that the recession will end with colder weather, and a far more general resumption of industrial activity, while not predicted, at least is hoped for. Used tools are in moderate demand, and inquiries for this class of equipment are increasing slowly.

DETROIT

The machinery and machine-tool market in the Detroit district is still depressed and there is no apparent prospect of improvement. There have been few sales of importance during September and a few scattering inquiries. Automobile manufacturers are still buying only the equipment they need urgently and most of this is for small replacements. They do not contemplate any large-scale purchases. General business shows some slight improvement, but this has not reflected itself in the sale of cars.

BUSINESS • BAROMETER

Prospects for a good Winter are favorable if November elections are undisturbing

THEODORE H. PRICE
Editor, Commerce and Finance, New York

DESPITE the imaginary lines that are called boundaries, the world of today is almost an economic unit. It is as true of the nations as of their citizens that the welfare of one is the concern of all. This fact compels the scientific student of affairs to include the world in his perspective and to interpret current happenings in an Esperanto which will be understood by all business men.

This was particularly true of last week. The rumors of political revolution in Germany have thus far proved to be unfounded, but their plausibility gave them currency, and they caused more or less liquidation in the stock market as well as in the commodity markets. Then there was the admission of some Soviet functionaries in this country that Russia had been selling wheat futures in Chicago by way of hedging the Russian-grown wheat that she had bought from her own producers. Inasmuch as there is an import duty of 42 cents a bushel on wheat brought into the United States from foreign countries, it is plain that Russia could not hope to deliver the grain it had sold in Chicago, and the administration at Washington was quick to intimate that such short sales unnecessarily depress prices, and are against the interests of the American farmer. The matter was brought to the attention of the Chicago Board of Trade. It is, however, difficult to see how such transactions can be prevented if the future markets of this country are to be kept open to the world.

The first effect of the disclosures referred to, and of further evidence that Russia is offering her wheat freely and cheaply in the world's markets, was a decline in the wheat market, which carried it down to the lowest price in 23 years. A moderate recovery ensued, but the speculators who have been relied upon to carry the surplus production were made hesitant by the Russian admission, and it will take time to convince them that the system of futures trading has not been imperiled by the inquisitorial attitude of our Government.

But wheat was not the only article that declined last week. Other staple commodities, including sugar, coffee, copper, silk, rubber, cotton, and cocoa, went lower. Their weakness cannot be attributed to the United States Government, and some much-respected authority, including Sir Josiah Stamp of England, are claiming that the decline in commodities is due to the demonetization of silver, and the insufficiency of a gold supply that must be impounded in the world's central banks if it is to serve as a basis for the paper currency in circulation.

By way of a remedy for this situation it has been suggested that Russia coin the platinum of which she is a producer, and that Great Britain and the United States join hands in making silver a legal tender at an agreed-upon ratio to gold. That this ratio would be artificial is self-evident, but the silver certificates that are in circulation in the United States are pointed out as examples of a fiat currency that is kept at par without effort.

Proposals to remonetize silver have often been urged when commodities were low. Most economists are against them, but those who are old enough to recollect 1896 and the attempt that William Jennings Bryan made to remonetize silver will realize that there is a very deep respect for silver money throughout the world, and that there are still many serious-minded and intelligent men who are in favor of it.

These are the three features of the week's economic news. They are given prominence because routine business calls for little comment. Trade is improving; sales are increasing; and unless there is some rude disturbance in confidence the autumn business will probably be good, even in some of the agricultural districts where the crops were cut short by the drouth.

On the New York Stock Exchange, there has been some liquidation and some bear selling. It is easy to unsettle confidence nowadays, and the liquidation seems to have been due to the operations of those who are trying to make money by going short. Both movements are, however, relatively unimportant. Cheap money is holding up the price of bonds and there seems no immediate likelihood of any advance in interest rates.

The steel industry is looking up. At the new low prices copper is passing into consumption at a rapid rate. Some improvement in the demand for automobiles is reported, but it is hard to be specific with regard to it. A number of large corporations have begun to buy raw material for future needs, on the theory that business will mend and prices will advance within a few months.

The national election will be held Nov. 4, and Congress will reconvene on the first Monday in December. If the election should indicate any substantial change in the political complexion of Congress the effect upon business might be somewhat disturbing; otherwise a winter of good trade and reasonable activity seems probable.

THE BUSINESS WEEK

October 1, 1930

A MAD WEEK from start to finish, mad with alarms, plots and rumors, governmental and private, brought into play or used by professional bears as a final desperate resort to squeeze the last drop of profit out of the short side of financial and commodity markets. This sort of thing is usual in the last stage of deflation, when prices have discounted all possible further business decline and are beginning to respond to the forces of recovery. Such forces are obviously though still feebly at work. Industrial production, except in steel, is still bumping along the August bottom, showing somewhat less than seasonal improvement, and primary distribution continues a bit backward. Building projects, especially residential, are doing better than was expected at this season, and general trade has shown more than seasonal expansion in September. Our preliminary index of business activity for the week ended September 20 has risen further from 84% of normal to 85.6%. The rate of improvement, however, is still too slow to warrant expectation of return to normal levels in the few remaining months of this year, without more vigorous Federal Reserve action and business leadership, of which there is still no sign. We have probably missed the train again this Fall, as we did last Spring.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

GRAY-IRON machinery castings dropped ½c. per lb., to 4c. at Detroit, during the week. This is in keeping with similar declines which have occurred recently in other important centers. Pig-iron prices, generally, continue weak and untested. The steel industry as a whole is operating at 60 per cent of capacity, against 83 per cent, a year ago. Tin plate mills, on the contrary, are now at full capacity. There is active demand this week, for steel plates to be used in oil-storage tanks. Other materials are in light demand. Fabricated brass and copper dropped another ½c. this week at New York. Pig lead is off ½c.; linseed oil is down 1.2c. per lb. Scrap non-ferrous metals declined sharply at Cleveland.

(All prices as of Sept. 26, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4.75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90@2.00	3.35†	3.00	3.40†
No. 12	1.95@2.05	3.45†	3.10	3.45†
No. 14	2.05@2.15	3.55†	3.20	3.50†
No. 16	2.15@2.25	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2.35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.30@2.40	3.65†	3.65	3.55
Nos. 12 to 14	2.40@2.50	3.75†	3.75	3.65
No. 16	2.50@2.60	3.85†	3.85	3.75
No. 18	2.65@2.75	4.00†	4.00	3.90
No. 20	2.80@2.90	4.15†	4.15	4.05
No. 22	2.85@2.95	4.20†	4.20	4.10
No. 24	3.00@3.10	4.35†	4.35	4.25
No. 26	3.25@3.35	4.60†	4.60	4.50
No. 28	3.50@3.60	4.85†	4.85	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58½	2.875	2.469	.203
¾	.76½	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.48	5.563	5.047	.258
1½	1.92	6.625	6.065	.28
2	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness Decimal	B.w.g. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	⅝	¾	1	1⅛	1¼
		Price per Foot								
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23		
.049″	18	.17	.18	.19	.20	.21	.23	.25		
.065″	16	.19	.20	.21	.22	.23	.25	.27		
.083″	14	.20	.22	.23	.24	.25	.27	.29		
.095″	13	.21	.23	.25	.26	.27	.29	.31		
.109″	12	.22	.24	.26	.27	.28	.30	.32		
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33		
.134″	10	.24	.26	.28	.29	.30	.32	.34		

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin., flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¾-in. thick by ¼-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			12.50
Tin, Straits, pigs, New York			32.00@33.00
Lead, pigs, E. St. Louis	5.35	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.25	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony slabs	10.00@10.50	11.00	10.75
Copper sheets*	20.25	20.50	20.75
Copper wire*	12.25	13.12½	13.12½
Copper, drawn, round*	18.75	19.00	19.25
Copper tubing*	22.50	22.75	23.00
Brass sheets, high*	17.37½	17.62½	17.87½
Brass tubing, high*	22.25	22.50	22.75
Brass rods, high*	15.62½	15.87½	16.12½
Brass wire, high*	17.87½	18.12½	18.37½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	23.30	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.11
Solder (½ and ½)	24.50	23.50	22@24

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	50.00
Commercial genuine, intermediate grade	37.00
Anti-friction metal, general service	31.00
No. 4 babbitt, f.o.b.	10.50

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.75 @9.00	8.75	8.75@ 9.25
Copper, heavy, and wire	8.25 @8.50	8.25	8.00@ 8.50
Copper, light, and bottoms	7.50 @7.75	7.25	7.00@ 7.50
Heavy lead	4.25 @4.37½	4.00	3.50@ 4.00
Tea lead	2.00 @2.25	2.50	2.50@ 3.00
Brass, heavy, yellow	5.25 @5.50	4.75	5.00@ 5.50
Brass, heavy, red	7.25 @7.50	8.00	7.25@ 7.75
Brass, light	4.25 @4.50	3.75	4.50@ 5.00
No. 1 rod-brass turnings	5.37½@5.50	5.25	5.00@ 5.50
Zinc	2.00 @2.25	1.50	1.75@ 2.00

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.14	38.00 per M	.14½
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb.	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.11	.141	.113
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.033
Cold fin. shafting	per lb.	.034	.034	.036
Brass rods	per lb.	.1562½	.1612½	.2125
Solder (½ and ½)	per lb.	.245	.245	.33
Cotton waste, white	per lb.	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	3.60
Lard cutting oil	per gal.	.65	.65	.75
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	75
Coke, prompt furnace, per net ton	Connellsville,		2.60
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.75
White lead, in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Calif., Los Angeles—Crane Co., Dunsmuir St. —traveling crane for proposed 80 x 150 ft. addition to pipe shop.

Calif., Pasadena—City will soon readvertise for bids for electrically operated crane and hoist for Municipal light and power department.

Conn., Bridgeport—J. L. Lucas & Son Inc., 3 Fox St.—17 or 22 in. Whitcomb planer.

Ill., Alton—H. C. Blaske—gasoline or electric single drum hoist.

Ill., Chicago — South Park Commissioners, M. E. Connelly, Secy., 57th St. and Cottage Grove Ave.—will receive bids until Oct. 8 for machine tools for Adler Planetarium.

O., Chillicothe—J. A. Morrison—24 in. lathe, automatic machine, air compressor bench tools for shop.

Ont., Galt—Galt Malleable Iron Co., Shade St., H. J. Bassett, Mgr.—prices on complete wood working equipment for pattern and carpenter shops now under construction. $25,000.

Opportunities for Future Business

Calif., Bakersfield — San Joaquin Light & Power Corp., Power Bldg., Fresno, awarded contract for a 1 story, 35 x 80 ft. meter shop here.

Calif., Emeryville — Furniture Corp. of America, H. A. Green, Pres., c/o Doernbecher Mfg. Co., East 28th St. N., Portland, Ore., plans the construction of a factory for the manufacture of upholstered furniture, mattresses, mirror, woodworking and assembly plant. Estimated cost $250,000. Architect not selected.

Calif., Los Angeles—Los Angeles School Dist., awarded contract for the construction of a school, including administration building, shops, etc. $339,805.

Calif., Oakland—Hoyt Heater Co., East 10th and High Sts., manufacturers of water heaters, awarded contract for a 1 story shop building. Estimated cost $15,000.

Conn., Bridgeport—T. J Pardy Construction Co., 1481 Seaview Ave., will build 1 story, 20 x 30 ft. addition to woodworking mill, 60 x 65 ft. storage building and 25 x 36 ft. blacksmith shop. Estimated cost $40,000. Private plans. Work will be done by owner's forces.

Conn., Danbury—Danbury & Bethel Gas & Electric Co., 238 Main St., awarded contract for the construction of a garage and service building on State St. Estimated cost $60,000. Noted Sept. 4.

Conn., New Britain—Eastern Malleable Iron Co., Inc., 63 John St., will soon award contract for a 2 story factory. Estimated cost to exceed $40,000. M. J. Unkelbach, 52 Main St., Archt.

Ill., Bellwood—Karco Corp., 3021 West Madison St., awarded contract for a 1 story, 75 x 200 ft. factory for the manufacture of welding rods and wire. Estimated cost $50,000.

Ill., Chicago—Goy-George Motor Co., Ford Agency, 4301 West North Ave., awarded contract for a garage and sales and service station at 4141-45 West Grand Ave. Estimated cost $100,000.

Ind., Fort Wayne—Fries Tool & Machine Co., 918 East Wayne St., will receive bids about Nov. 1 for addition to factory. Estimated cost $40,000. G. Mahurin, 425 Standard Bldg., Archt.

Ia., Oelwein—City awarded contract for the construction of a maintenance garage.

Ia., Sioux City — Interstate Transit Lines, c/o R. J. Walsh, Pres., awarded contract for a 2 story, 104 x 150 ft. bus terminal. Estimated cost $150,000.

Mass., Boston—American International Engineering & Equipment Association Syndicate, c/o J. H. Hodsdon, 53 State St., Engr., is having preliminary plans prepared for a ship and railroad terminal consisting of nine buildings, four piers, railroad yard, etc., on Mt. Vernon St. Estimated cost $40,000.

Mass., Boston—Boston Terminal Co., South Station, plans the construction of a 2 story, 100 x 600 ft. postal work shop. Estimated cost $40,000. Private plans.

Mass., Boston — R. C. A. Victor Co., 76 Atherton St., awarded contract for a 2 story factory for the manufacture of radios. Estimated cost $50,000.

Mass., Dorchester (Boston P. O.)—Thompson Wire Co., 43 Mildred Ave., awarded contract for a 1 story factory. Estimated cost $40,000.

Mass., Fitchburg—Simonds Saw & Steel Co., 55 North St., awarded contract for the construction of a 360 x 550 ft. manufacturing plant. Estimated cost $1,500,000. Noted Sept. 4.

Mass., Greenfield—Greenfield Buick Co., J. S. Faulkner, will build a 1 story service garage on Miles St. Estimated cost $50,000. Work will be done by separate contracts.

Mass., Quincy—Eastern Massachusetts Street Railway Co., 38 Chauncy St., Boston, awarded contract for the reconstruction of a garage at 954 Hancock St. Estimated cost to exceed $40,000.

Mass., Whitman—F. J. Carey, 55 George St., plans to rebuild bus garage recently destroyed by fire. Estimated cost $60,000. Architect not selected.

Mich., Detroit — Great Lakes Steel Corp., Tecumseh Rd., subsidiary of National Steel Corp., 1319 Kingsbury St., Chicago, Ill., plans the construction of a 10 in. merchant mill here.

Mich., Holland — Holland Furnace Co., awarded contract for a 3 story, 40 x 200 ft. office, including service department on Columbia Ave. Estimated cost $250,000.

N. J., Maplewood — LeRoy Schenck, 513 Valey St., rejected bids for a 2 story shop and garage. Estimated cost $40,000. R. B. Flatt, 600 Bloomfield Ave., Bloomfield, Archt. Noted Aug. 7.

N. J., Newark—Beacon Upholstering Co., 23 Rankin St., is having preliminary plans prepared for the construction of a factory at Belmont and Hawthorne Aves. Estimated cost $75,000. Siegler & Greenberg, 164 Market St., Archts.

N. J., Union City—F. Romano, 352 New York Ave., is having sketches made for the construction of a 2 story garage at 14th St., Estimated cost $155,000. J. G. Helmers, 145 Summit Ave., Archt.

N. Y., Attica — Dept. of Correction, Capitol, Albany, will receive bids about Nov. 1 for a group of buildings, including administration building, shop buildings, maintenance storehouse, etc., for Attica State Prison here. Estimated cost to exceed $1,000,000.

N. Y., Auburn—Dept. of Correction, State Bldg., Capitol, Albany, will receive bids about Oct. 1 for the construction of a foundry and shop building, etc., for Auburn Prison, here. Noted Sept. 18.

N. Y., Brooklyn—J. S. Kennedy, 157 Remsen St., Archt., will receive bids late in November for the construction of a service garage at Pacific St. and Boerum Pl., for Court Sq. Sales & Renting Corp., 26 Court St. Estimated cost $375,000.

N. Y., Brooklyn—J. Kostman, Flatbush and Nostrand Aves., will receive bids about Dec. 1 for a 2 story addition to service garage at Flatbush and Nostrand Aves. Estimated cost $40,000. F. H. Klie, 250 Park Ave., New York, Archt. Noted Sept. 11.

N. Y., Brooklyn — C. Strang, 356 Coney Island Ave., is receiving bids for the construction of a service garage at Coney Island Ave. and Cator Pl. Estimated cost $50,000. E. M. Adelsohn, 26 Court St., Archt. Noted July 3.

N. Y., Brooklyn—R. Sanders, 494 14th St., will soon receive bids for the construction of a 2 story, 50 x 163 ft. service garage at Prospect and East 5th Aves. Estimated cost $75,000. F. H. Klie, 250 Park Ave., New York, Archt. Noted Sept. 11.

N. Y., Long Island — Brooklyn & Queens Transit Co., 385 Flatbush Ave., Brooklyn, will build a car repair shop, here. Estimated cost $75,000. H. J. Kolb, c/o Owner, Archt. Work will be done by day labor. Noted June 19.

N. Y., New York—Consolidated Gas Co., 4 Irving Pl., will soon receive bids for the construction of a 3 story, 99 x 100 ft. repair shop at 71st and Exterior Sts. Estimated cost $350,000. Private plans. Noted July 3.

N. Y., New York—Helklar Realty Corp., 1891 Fort Washington Ave., is receiving bids for a 2 story, 100 x 109 ft. service garage at Webster Ave. and 204th St. Estimated cost $75,000. H. T. Feldman, 15 West 44th St., Archt. Noted Sept. 11.

N. Y., New York—F. Levy, 60 Wadsworth Ave., plans the construction of an automobile repair shop at 651 West 176th St. Estimated cost $40,000. B. R. Swarthburg, 2 West 46th St., Archt. Maturity in spring. Noted Sept. 18.

O., Cleveland — Cleveland Wire Works, Incandescent Lamp Dept. of General Electric Co., E. G. Edwards, Mgr. of Plant Extensions, Nela Park, is having plans prepared for a 1 story, 320 x 370 ft. factory power house and boiler house on Chardon Rd. Estimated cost $750,000. Private plans. Noted Sept. 11.

O., East Palestine—Adamson Mfg. Co., will soon receive bids for the construction of a 1 story factory for the manufacture of steel storage tanks on East Clark St. Estimated cost $40,000.

Pa., Washington—Bd. of Education, R. C. Buchanan, Pres., Jefferson and Wylie Aves., received lowest bid for a junior and senior high school, including 72 x 125 ft. shop building, etc., at Jefferson and West Hallam Aves., from C. W. Shimp, Hawley Bldg., Wheeling, W. Va. Estimated cost $900,000. Noted Sept. 4.

R. I., Lincoln (mail Central Falls)—Dept. State Police, awarded contract for a police barracks and garage on Turnpike. Estimated cost $75,000.

South Carolina—State Highway Dept., Columbia, awarded contract for a number of maintenance shops in Calhoun, Clarendon, Saluda and Georgetown counties.

Tenn., Knoxville—Knoxville Table & Chair Co., recently incorporated, plans the construction of a factory on Proctor St.

Wash., Seattle — J. C. Stanley, Republic Bldg., Archt., will receive bids until Oct. 10 for the construction of a 2 story, 120 x 360 ft. garage at 9th Ave. and John St., for Commercial Tire Co., Westlake and Lenora Sts. Estimated cost $500,000.

Ont., Brockville—Eugene F. Phillips Electrical Works Ltd., 12 Mercer St., Toronto, will soon award contract for a 1 story addition to electric wire plant, including new electrical shop, machine shop, boiler house, rubber room, braiding room, finishing shop, etc. Estimated cost $500,000. J. M. Miller, 648 Dorchester St., Montreal, Que., Archt. Noted Sept. 11.

Ont., Hamilton—Canada Iron Foundries Ltd., Stuart St., awarded contract for a 1 story, 90 x 140 ft. casting plant and pattern shop. Estimated cost $50,000.

Ont., Toronto—Bd. of Education, 155 College St., will soon receive bids for a 3 story addition to Earl Beatty school, including manual training room, etc. Also plans a 4 story garage and workshop. Estimated cost $175,000 and $204,000 respectively. C. E. Dyson, 155 College St., Archt.

Que., Montreal—I. L. Vachon Ltd., 5604 St. Hubert St., plans the construction of a sash and door factory. Estimated cost $60,000.